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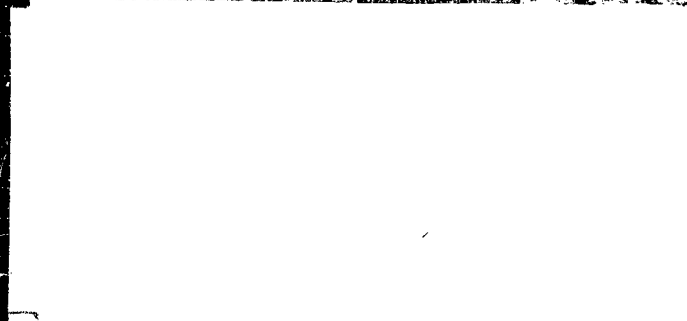
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Final Report 63-3-2

STRATEGIC AND TACTICAL
ASPECTS OF CIVIL DEFENSE WITH
SPECIAL EMPHASIS ON CRISIS SITUATIONS

Prepared under Contract No. OCD-OS-62-18 for the
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Hudson Institute, Quaker Ridge Road, Harmon-on-Hudson, New York

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OCD REVIEW NOTICE

This Report has been reviewed in the Office
of Civil Defense and Approved for Publication.

Prefatory Note

The conclusions, recommendations, and judgments throughout this report are those of the particular group of researchers who formed the civil defense team and who take the responsibility for such statements. It is intended soon to become standard Institute procedure for our reports to be Institute Reports in the following sense. Each report will have been offered for review to our research staff; criticisms and differing views discussed and possibly reconciled; and, finally, remaining differences from the stated views presented in some appropriate form (perhaps appended under the respective signatures of those who hold such differences). For this report it was felt in view of the recent rapid growth of the staff that it would place an undue burden upon those unfamiliar with this report to study, assimilate and respond in the short time available. It is our intention, however, to obtain such reactions from our full staff during the next few months.

Acknowledgements

We would like to express our appreciation for the assistance and understanding of the OCD Research Division. Particularly helpful to us during this last year were John Devaney, Ralph Garrett, and Jerry Strobe.

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PREFACE

Since this is the first report the Hudson Institute is submitting to the OCD, a few remarks on how the kind of research the Hudson Institute specializes in might contribute to the OCD program are in order.

As a policy research organization Hudson Institute sees itself fulfilling at least two roles: (1) creative and (2) analytic.

Creative Role in the OCD Project

The civil defense program will be in a continual state of flux and, we expect, will thus have a continuing need for the guidance of creative thinking, especially with respect to research design. The creative role particularly focuses on changes in civil defense programs as we look into the future. As a consequence of effective policy, there can be and often should be periodic revolutions in the existing systems toward which the research is directed. At frequent intervals a fresh look should be taken at the OCD program, its functions, requirements, interactions, and possible environments. Thus one of the principal purposes of our report is to examine some new roles which civil defense might play, to make a preliminary study of the feasibility of some of the concepts involved in these roles, and to examine the inherent implications.

Analytic Role -- Broad Studies

A second way in which the Institute can serve OCD is in providing analyses of some of the important problems in civil defense; especially those involving the political, strategic, tactical, and social aspects of civil defense. The Institute approaches such complex problems through research in various relevant disciplines, extracting from each its unique contribution and, hopefully, resolving conflicts which may develop among the different contributors. Through confrontations of people and integration of ideas drawn from various specialties, we try to achieve a comprehensive and integrated analysis. Without an emphasis on confrontation and integration the

use of interdisciplinary planning of teams tends to degenerate into an anthology of unrelated pieces.

In a very general way this report is organized to consider the various aspects of civil defense systems as follows:

Chapter I -- Methodology
Chapter II -- Context
Chapter III -- Strategy
Chapter IV -- Tactics
Chapter V -- Feasibility

Analytic Role -- Detailed Feasibility Studies

The analytical tasks of Chapter V of this report constitute, first, a fairly detailed effort developing and relating several aspects of strategic evacuation and, second, a preliminary feasibility study of the use of evacuation plus improvised shelter as a civil defense technique during an intense crisis. The detailed work, in addition to its value to the study, contributes to our own program to achieve a substantial degree of in-house competence in the "hardware" aspects of civil defense. Our conceptual analysis should become more competent as our researchers acquire more basic training and insight through active participation in making such calculations as those developed in Chapter V. We might hazard an even stronger remark, that we think many research workers will not function adequately without some prior training on projects of this sort. This is an heuristic approach, the usefulness of which is not easily measured in any objective way, but which is not challenged by the senior members of the Hudson Institute's staff nor, we hope, by the OCD.

The in-house capability achieved by designing a specific crisis evacuation study will, we think, be useful in adding to our competence in a range of evacuation problems and such associated problems as emergency shelter, social conditions, warning and communication, command and control, radiation effects, medical requirements, and survival supplies. These are clearly matters associated with almost any kind of civil defense planning and which must be properly understood before a thorough analysis can be concluded on matters of strategy, tactics, or foreign affairs.

The second task of Chapter V, developing a preliminary feasibility study of a crisis civil defense plan, has several purposes. First, it furnishes a concrete illustration of the main theme of Chapter IV; namely, the possibility of designing a set of special civil defense plans for possible use during future crises. Second, because of its specific nature, it offers a basis in plan design for improvement and development, a possible prelude to formulating an operational plan. Third, it provides a solid vehicle which we and others can use for studying some strategic, tactical, political, or social problems--especially those associated with intense crisis.

Services to Other Contractors

This report should prove useful to other OCD research contractors. First, in providing a general framework or broad context, a perspective on civil defense is gained which should facilitate useful formulations of problems posed in existing or future contracts. Second, it gives, in some important areas, specific hints or directions for either proceeding towards solutions or developing an effective analysis which can provide a basis for choice or decision. (For example: crash programs, evacuation studies, emergency shelter problems.) Third, the preliminary feasibility study of Chapter V can be examined for its relation to the problems of many existing contracts (communication, food, water, ventilation, etc.), or it may, by refinement and development, provide the beginning for actual emergency plans.

Contributors

Several members of the Institute research staff have contributed to this report. Because of the interacting nature of the material, it is so frequently impossible to give credit in fair proportion that we will simply list contributing members of the research team in alphabetical order:

Frank Armbruster
William Brown
Herman Kahn
John Kaplan
Cresson Kearny
Richard Krickus
Stanley Newman
Frederick Rockett
Leon Sharpe
Jeremy Stone
Chester Williams

SUMMARY AND CONCLUSIONS

This summary is an attempt to condense the substance of the report in order to reduce the strain of reading the entire report to those whose interest is restricted or where time is limited. It tries to follow the topical material sequentially and accordingly is arranged by chapters and subsections. In order to reduce the material as drastically as this summary does, it was frequently necessary to provide very thin abstractions of some sections. These are author's decisions and necessarily constituted a set of harsh choices with which there was much discomfort.

This report is structured in the manner set forth below to consider some crisis aspects of civil defense systems:

Chapter I -- Methodological Considerations

Chapter II -- General Context for Crisis Planning

Chapter III -- Strategic Aspects of Civil Defense

Chapter IV -- Civil Defense Tactics in Crisis Situations

Chapter V -- A Preliminary Feasibility Study of One Civil Defense Tactic

The report attempts to (1) provide a broad context for civil defense; (2) give specific hints and directions towards possible solutions of some important civil defense problems; and, (3) study the feasibility of one specific civil defense tactic (i.e., strategic evacuation).

CHAPTER IThe Problem

Warning of an impending attack may come from "political" as well as "physical" events (e.g., bomb alarm, radar networks, air observers, etc.). While physical warnings will provide only minutes to hours for taking protective actions, political warnings may allow from hours to years for accelerating action to protect populations. The strategy and tactics for exploiting political warnings are developed in Chapters III, IV and V of this report.

Perhaps more important than the usual question "How do we know which political events require or justify protective action?" is the one rarely asked: "What are the possible effects of taking

protective action in response to various kinds of ambiguous political warnings?" With proper preparations, it should be possible to enhance the desirable political effects of civil defense actions while diminishing the undesirable effects. Thus, to control the interaction of civil defense and foreign policy, a wide range of civil defense protective actions must be analyzed in the context of various types of international crises that might occur in the next ten years. In addition to individual crises and their interaction with civil defense preparations, certain tactics, such as escalation and international bargaining, should be studied in terms of dominant U.S. strategic objectives.

The General Context

An awareness of the general framework and limits within which this study is thought to be useful centers on two questions: (1) "What is the world really like now?" and (2) "What can the world be like in the future?" To provide such a general context, seven dimensions of possible projections into the future appear relevant:

1. The technology of the future and its relevance for weapons systems and civil defense.
2. The evolution of political alignments, re-alignments, and blocs.
3. The arms race and the diffusion of nuclear weapons.
4. The nature and kinds of crises.
5. The nature of future wars--kinds, duration, number and sizes of bombs, and choice of tactics.
6. The termination of future wars--dependence on technical and political factors.
7. The nature and extent of possible civil defense programs.

In order to study the interactions possible in these dimensions, various techniques, such as hypothetical narratives (scenarios), "war and peace gaming," etc., are used. These assist the imagination and facilitate projection into the future.

The methodology here advocated combines the broad understanding of the general context of the civil defense problem with the hard experience gained from a set of studies set in specific contexts. Before selecting specific parameters for a study, the full range of

each dimension which may be important for the study, should be understood. Chapter II of this report, and to some extent Chapter III, contain a description of the major dimensions and sub-dimensions, together with representative possible interactions, to provide a framework for subsequent specific studies.

CHAPTER II

Chapter II of the report is concerned with providing a context for studies of international crises in the sixties and early seventies. Of particular interest here is the special role played by military technology, and its effects on doctrine, strategy, tactics, civil defense, and international relations. The problems with which civil defense programs are more directly concerned receive greater emphasis in the subsequent chapters.

Technology and Doctrinal Lag

The first section of the chapter describes three "technological revolutions" that have occurred since World War II (1951, 1956, and 1961), with particular emphasis on the way doctrinal lags have dominated the thinking of strategists and planners during this period. A doctrinal lag is defined "as a failure to change ideas in response to changing circumstances." It is pointed out, by use of various examples, that technological progress has been, and is likely to be in the future, of such rapidity that doctrinal lags are bound to occur. This inertia in thinking is considered dangerous because it leads to (1) important gaps in military preparations, (2) the waste of needed resources on obsolete concepts, (3) the neglect of possible sources of strength, (4) the excessive use of "glamorous" tools, and most important, (5) possibilities of serious miscalculations or accidents resulting from insufficient time to understand and make provisions for the requirements of newly installed weapons systems. Three likely technologies of the future, in 1965, 1969 and 1973 settings, are also examined, along with some of their strategic and psychological implications. In view of increased spending on research and development, future technological breakthroughs may occur more rapidly, and the problem of doctrinal lag may become exacerbated.

Abstract Models and Scenarios

Various simplified hypothetical models are presented in Section II of Chapter II. These models do not reflect reality, but are intended to stimulate thought, demonstrate elementary principles, and permit

formulation of definitions and concepts. The first model, which illustrates varying degrees of a first-strike advantage, assumes that two potential opponents have a fixed number of equal-valued targets, but that civil defense preparations and the number and vulnerability of the missiles each possesses are variable. If each country had an equal number of vulnerable missiles, sufficient to destroy the other's missiles and cities, the "balance of terror" would be highly unstable, since the side that strikes first would have an overwhelming advantage. By assigning each side a relatively small number of invulnerable missiles, "multistable" deterrence is attained, since the first-strike advantage is considerably reduced. The relative position of each opponent in regard to the other's first-strike capability may be further improved by the addition of (1) civil defense capabilities (fallout protection and evacuation) and (2) a substantial second-strike capacity consisting of invulnerable missiles.

The second model assumes that both sides have an equal number of totally invulnerable missiles. The greater the number of invulnerable missiles held by both sides, the more stable becomes the mutual deterrence. For a near-absolute balance of terror a large overkill factor may be needed to deter completely irrational (mad) behavior. Although, by and large, neither side can get any advantages from massive use of their weapons in a near-absolute balance of terror, a number of "bargaining techniques" based upon the residual fear of war, appear possible. Those discussed are: (1) manipulation of the threat of war; (2) "Ban-the-Bomb" movements; (3) limited nuclear punishment; (4) limited general war; and (5) the use of escalation. A hypothetical "escalation ladder" of possible future crises and some of its consequences are considered in detail.

Although stable in the short run, the present policy of military deterrence is thought to have an inherent long-run instability, which makes modifications, or complete abolition, of the threat system likely. A number of alternatives are considered, including (1) a withering away of the all-out war systems and replacement by a) rule of law, b) rule of fait accompli, c) instrumental wars, or d) agonistic wars; (2) basic changes of the system, such as a bloc system, community sanctions, condominiums, a concert of powers, or world government; and (3) the elimination of weapons of mass destruction, either by agreement, by revulsion, or by an "armageddon."

The remainder of Section II (Chapter II) deals with simple models of primarily asymmetrical deterrence. The first model considers the effectiveness of Type I Deterrence (Table 21), where the two sides are equipped with an unequal number of invulnerable missiles. An asymmetry of as much as 100 to 1 between the two sides, with one having an overkill capability by a factor of 100 and

the other just sufficient capacity to wipe out the other's population, can result in an almost absolute balance of terror. Even if one side has only a few invulnerable missiles which threaten millions of the enemy's citizens, the situation, though highly asymmetrical, might still result in a workable deterrent. A contrasting situation is considered in a second case in which both sides have highly vulnerable, reliable, and dispersed missiles. The deterrence is now highly unstable, since the side with a few more missiles could launch a disarming first strike upon the other. Even if both sides had a large and equal number of missiles, there would still be a first-strike advantage, leading to a "reciprocal fear of surprise attack."

The final model introduces the assumption of relative (rather than complete) invulnerability of the missiles (see Table 22). The balance of terror with relatively invulnerable missiles may be less stable than with absolutely invulnerable missiles and, therefore, each side must have a greater overkill capability to assure near-absolute deterrence of the other. A considerable missile preponderance of one side over the other may be relatively stable, especially if the weaker side has a few protected, completely reliable and invulnerable missiles. If the side with fewer missiles had fallout protection, however, it would actually decrease its ability to deter its opponent because he could now engage in a less destructive and, hence, more controlled counterforce operation with less danger of escalation. Additional capabilities by the weaker side of evacuation and/or recuperation would make the balance of terror still more asymmetric in favor of the stronger side, which now could look upon all-out war as more feasible. Several variations in such unstable, asymmetric deterrent situations are considered.

Analysis of Controlled War

Section III of Chapter II describes a preliminary system analysis of a real-world situation, that of a Controlled Counterforce War. A number of factors associated with the problems of such a war are discussed (see Table 23). Among these are: (1) the relationship among the limitations, constraints, and stability of a Controlled Counterforce War; (2) the design, creation, and acceptance of "rules" that would avoid a mutually disastrous outcome of the war; (3) a contingency analysis, or design, that provides sufficient flexibility for a wide range of circumstances. (Such flexibility may be achieved in two basic ways. One is the preparation of many alternatives that would permit hedging against "bad" and exploiting "good" situations. A second way is to make the design insensitive to events, so that the system itself will hedge against the bad and be capable of exploiting the good.) (4) a cost-effectiveness analysis; though traditionally conducted in

terms of dollars vs. targets destroyed, an adequate study would entail other payoffs and costs, such as prewar conflict management, arms race and stability, and postattack bargaining.

The report then concentrates on a detailed analysis of effectiveness in terms of the improvement of one's postattack bargaining position, which may be termed the "payoff function." This analysis takes into account such factors (Table 24) as: (1) the current and future mutual threats of the opponents in terms of population, recuperation capability, wealth, countervalue and counterforce capability; (2) the promises each country can make the other, their value and credibility; and (3) the comparative resolve of each country, as characterized by its morale, expectations, and attitudes, the emotional and objective state of each country, and its strategy, tactics, and technical capabilities.

Section III, further, contains a comparison of two typical strategic controlled war systems around which the future military policy debate is likely to revolve: (1) Finite deterrence plus limited strategic retaliation (controlled reprisal) and (2) Counterforce and not incredible first-strike capability. A number of aspects and characteristics of these two systems are listed in Table 25 and are discussed in the report. A methodological (abstract) analysis of the systems may appear to favor the Counterforce system because of its ability to deal with "Hitlers" and the more limited destruction it would cause, if war should occur, compared to that likely to result from use of the Finite Deterrence system.

Finally, Section III describes eight special situations (see Table 27) involving lower-priority strategic missions, which would have to be taken into account when making a choice between strategic systems.

Coping with the Real Future

Section IV of Chapter II attempts to deal with the real world and its future by briefly sketching the present and future environment (the early sixties and early seventies) and then considering national strategies and tactics designed to achieve desired objectives within that environment.

Table 28 lists salient political and military features that are likely to dominate the early sixties. Among the political aspects considered are (1) the growing trend of a primarily bipolar world toward a form of polycentrism, in both the West and the East; (2) the weakening and passing of the European nation-state system; (3) the liquidation of colonialism and pan-nationalism; (4) the revolution of rising expectations; and (5) the indications of future

multipolarity. The military context of the early sixties includes the following points: (1) an annual world-wide expenditure of \$120 billion on defense; (2) the technology of the early sixties previously described (in Section 1); (3) a continuing first-strike advantage; (4) continuing U.S. strategic superiority and forces that operate on an "alert" basis; (5) several nuclear countries, in addition to the U.S. and Soviet Union, including England, France, and, perhaps, China; and (6) implicit arms control to contain a potentially explosive situation.

The environment of the early seventies (see Table 30) is likely to have additional participants in the arms race, such as a European Economic Community (with a GNP equal to that of the U.S. in 1960), and Red China--with a capability in many basic industries (steel, cement, electric power, etc.) equal to that of Great Britain or the Soviet Union in 1960, an urban population of about 200 million, and a vast "rural slum" of, perhaps, 600 million. It is thought likely that there will be five to ten other nations capable of spending more than a billion dollars a year on national defense and, possibly, ten to twenty nations spending between 100 million and one billion dollars per year on defense.

The military technology of the early seventies is considered likely to include cheap, simple, missile systems; increased capabilities for bacteriological, chemical, and disguised warfare; possible "doomsday machines"; computers capable of operating at gigacycle speeds; and ground-effect machines. Among political strains likely to be experienced in this period are a growing fear of the arms race and the resulting growth in influence of "Ban-the-Bomb" and unilateral disarmament groups. It is believed possible that rising nationalism (among new nations), racism, envy, greed exacerbated by the population explosion, and a partial frustration of the revolution of rising expectations may act as spurs to the wider diffusion of nuclear and other weapons systems and a general acceleration of technology, while imposing considerable strains on the degree of international order that may exist by then.

Chapter II concludes with a discussion of 14 alternative national strategies designed to meet the problem of the arms race and the threat posed by the Soviet Union. Ranging from an extreme passivity to extreme activity, in this order, these alternative policies are (see Table 32): (1) act of renunciation, (2) unilateral initiatives, (3) minimum deterrence, (4) rule of law, (5) "Fortress America", (6) accept arms race reluctantly, (7) follow technology, (8) a not incredible first-strike, (9) concert of powers, (10) the "aggressive democrat", (11) credible first-strike, (12) protracted conflict, (13) win, and (14) preventive war.

CHAPTER III

War and Deterrence

There are at least nine broad strategic objectives of current U.S. military policy, within whose context civil defense is to be considered. They are:

1. Deter a deliberate large-scale countervalue-element attack on the United States. This includes also a mixed counterforce and countervalue (counterforce plus bonus) attack.
2. Deter a controlled reprisal against the United States; that is, a relatively small-scale countervalue nuclear attack as part of a limited strategic strike.
3. Deter a counterforce action against the United States.
4. Deter extremely provocative actions, including attacks against U.S. allies, but short of a direct attack on U.S.
5. Deter more limited incursions on the non-communist world, such as a Berlin blockade or attacks on less vital areas.
6. Limit damage to the U.S. and Allied population and wealth, and improve the military and political outcome, in the event one of the above deterrents fails.
7. Reduce the likelihood of inadvertent thermonuclear war.
8. Control and limit both the arms race and the threat of or use of force in settling disputes.
9. Accomplish the above objectives while preserving our democratic values.

Deterrence Concept

Five of the strategic objectives listed above are based upon "deterrence." This is a double concept, which describes a relationship in which one party refrains from committing a "provocation" for fear of another's "response." Accordingly, deterrence may be classified in terms of threats, in terms of actions one seeks to deter (provocations), or in terms of combinations of actions and responses. The last method of classification is sometimes subdivided

into "passive" and "active" deterrence, depending upon whether or not the provocation brings the threat into action automatically, without intervention of an act of will. For simplicity, the discussion in Chapter III is concerned only with provocations and means of deterrence in terms of the five strategic deterrence objectives mentioned.

Provocations

1. Deterrence of All-Out Countervalue Attack on the United States

Since deterrence is partially based upon psychological elements, the appearance and credibility to the enemy of the deterrent system is as important as its objective capability. We must maintain a military capability that is sufficient to convince an enemy that an attack would be irrational and would result in an unacceptable amount of retaliatory damage. This requires an ability to strike back even after a Soviet counterforce attack and after they have exhausted all measures to prevent retaliation. Thus, a complete deterrent must provide an objective basis to persuade Soviet decision-makers that an attack on the U.S. would lead to the assurance of unacceptable large-scale destruction of the Soviet civil society and its military forces. The achievement of such a deterrent may conflict with other objectives, such as arms control and the prevention of accidental war.

2. Deterrence of Limited Strategic Attacks Against United States

A limited strategic attack, a type of controlled war, may be a last-ditch alternative to all-out thermonuclear war. It is undertaken in the hope that the controlled punishment will force one's will on the opponent, and persuade him to accept a "reasonable" settlement. Such attacks may consist of the destruction of a single American city, and the consequent retaliatory destruction of an equivalent Soviet city. The nation initiating a limited strategic attack must have sufficient means of deterrence to prevent a more violent retaliation; that is, it relies on the threat of escalation to diminish retaliation. Any such "controlled" attack, however, involves serious danger of escalation to a larger war, results in great suffering and damage, and militates against long-run stability.

3. Deterrence of Controlled Counterforce Actions Against U.S.

Controlled counterforce actions are intended to put bargaining pressure on an opponent by weakening his ability to harm us and, in the limit, by threatening him with defenselessness. An attacker who has chosen a controlled counterforce attack is not necessarily relying on effective intra-war deterrence against countervalue reprisals. He may simply believe that the probabilities and benefits are worth the potential losses. The concept of controlled counterforce is essentially continuous all the way from the destruction of one soft missile to a complete all-out counterforce attack, though at the lower levels it partakes more of the character of a limited strategic attack (see 2, above) than a disarming attack.

4. Deterrence of Attacks Upon Vital Interests

The provocation to be deterred is a massive attack, either conventional or nuclear, upon vital American interests. Although conventional weapons defense by Euratom and Common Market nations (including England) might be potentially adequate to deal with Soviet attacks, the history of NATO suggests that conventional European defense might fail. Hence, we rely partly on nuclear deterrence.

5. Deterrence of Lesser Provocations

The actual number of challenges in this category includes a large fraction of the foreign and military policy problems we face today. Typical examples that may be cited include Russian interference in Hungary, Korea, and Southeast Asia, the threat of a Chinese attack on Formosa, programs of espionage, threatening notes, and so on. Though it may be important to deter "salami tactics," few would urge threatening an all-out war to deter or avenge them. Civil defense, however, helps set the context and thus may be important in a passive manner.

Means of Deterrence

Responses to the five types of provocations described may include various non-military means. The military (deterrent) threats, like the provocations, may be divided into five major categories. These are summarized in the following paragraphs.

1. Deterrence by Threat of Countervalue Element Attack on the Soviet Union

Although, theoretically, this threat could be used to deter any kind of provocation, it is not a credible threat except for major transgressions. An inflexible command and control with automatic countervalue response would be one of the most effective ways of deterring a Soviet countervalue-element attack. An automatic response, however, has disadvantages.

2. Deterrence by Threat of Limited Strategic Retaliation Against the Soviet Union

This threat involves the destruction of a countervalue target (a city, dam, diffusion plant, etc.) to retaliate for either a single provocation or continued "one-per-day" destruction of valued targets. The threat is probably not sufficient to deter reliably a large-scale countervalue-element attack, nor is it suitable to deter minor provocations because of the damage it causes and the danger of escalation.

3. Deterrence by Threat of Controlled Counterforce Attack Against the Soviet Union

This is a more useful means of deterrence than those previously mentioned, because it should be less costly and risky, and yet is more effective and, hence, more credible. Controlled counterforce actions are most effective militarily in the absence of a true balance of terror; that is, when at least one side does not have a second-strike overkill capacity. This type of situation should favor the United States in the early sixties.

4. Deterrence by Threat of Limited War

Limited war includes defense in the traditional sense. In areas where we may be able to summon as much limited war capability as the Soviets, this type of deterrence can be effective. Other areas must be protected by residual fears of all-out war, danger of escalation, and other means.

5. Deterrence by Threat of Mobilization and Increased Capability

Deterrence by means of the threat of mobilization does not involve the direct threat of military action, but consists of the purchase of various capabilities, such as improved military forces,

serious civil defense programs, and other related efforts to increase our ability to win a controlled war against the Soviet Union. Although thought of primarily as an insurance measure, civil defense can be a major part of our deterrent posture under some circumstances. A Khrushchev-Kennedy scenario in Chapter III illustrates this possibility. The threat of increased mobilization and an accelerated arms race probably would have the following general effects: (1) it is costly to the Soviets in that it forces them to match and neutralize any advantage we have gained; (2) it makes the use of other means of deterrence more likely because of our increased capability; and (3) by contributing to the arms race, it increases the mutual danger.

Inasmuch as this means of deterrence is not only a threat, but upon failure becomes the purchase of increased capacity, it possesses a degree of flexibility not present in the previously described deterrents. Mobilization is expensive in materials, but not in lives, and the material outlay can be varied with the provocation. Below are listed three mobilization threats, in order of increasing deterrence:

1. Increase defense expenditures and gain a modest civil defense capability.
2. Gain an excellent civil defense capability.
3. Invoke civil defense protective actions.

A Deterrence Diagram

A whole range of provocations and means of deterrence may be matched up in a matrix, labeled a deterrence diagram, where the provocations are set out in a column and the means of deterrence in a row. A "realistic" diagram would require many rows and columns; an illustrative 5 x 5 deterrence diagram is shown in Chapter III (Figure 1).

CHAPTER IV

Chapter IV is concerned with alternative civil defense programs, both as insurance and as a facet of deterrence by the threat of increased capability. A range of civil defense programs is considered in the light of possible future crises. This suggests that civil defense preparations and plans can be geared to the circumstances surrounding such crises.

Interpretation of Fever Charts

The hypothetical "fever" chart shown in Chapter IV represents the future tension that might develop in any country as a function of time. The graph indicates that crises tend to have spikes--sharp rises followed by sharp declines. The abrupt rises represent, in part, complicated psychological phenomena, while the precipitous declines may in addition reflect the fact that in times of severe crisis extraordinary efforts are made to obtain an acceptable resolution. Also shown (Fig. 3) is a historical fever chart, which represents one estimate of the tensions arising from European events beginning with Hitler's advent to power in 1933 and continuing to the outbreak of the second world war in 1939.

An examination of these fever charts suggests the following observations and conclusions for civil defense:

1. There is a substantial probability that any future war will be preceded by a period during which strategic warning will be given by military and/or political actions.
2. Although the period of time involved in the characteristic rising and falling portions of the chart can vary considerably, it may be expected to be in the order of at least hours or days, and, judging from historical examples, usually much longer. Early peaks are often considered as warning of later peaks, so that for some actions (e.g. accelerated programs) the time between peaks, rather than the rise time is the relevant variable.
3. If the available time for emergency civil defense action is of the order of two days or more, it should be possible (see Chapter V) to develop more civil defense capability during this brief period of severe crisis than has been obtained by this country in all of its efforts since World War II. This assertion assumes that a reasonable amount of advance planning specifically for crisis action has been completed.

4. While the base line in a general type of fever chart may be drawn either rising or declining, the base line that represents the actual recent international situation is judged to be increasing with time because of the cold war and entry into the thermonuclear age. The effects of the rising base line can be expected to make the response to crises more rapid and result in higher peaks.

5. A suggestion implicit in the fever chart is that advance plans may be prepared which during subsequent times of greater tension, enable the OCD to respond rapidly and effectively to the demands of an aroused citizenry for a larger national civil defense program.

Seven Civil Defense Tactics

Any complete civil defense program can be designed to contain a range of tactics to cover nearly any kind of emergency that might arise. The table below lists, in order of decreasing urgency, seven distinct civil defense tactics, which cover a spectrum of possible actions discussed more fully in Chapter IV.

I. Crisis Programs

- | | |
|------------------------|----------------------|
| A. Improvised Action | (0 - 6 months) |
| 1) Desperate | (1 hour - 7 days) |
| 2) Crash | (2 days - 2 weeks) |
| 3) Emergency | (1 week - 6 months) |
| B. Mobilization Action | (3 months - 2 years) |
| 1) Wartime | (3 months - 1 year) |
| 2) Peacetime | (6 months - 2 years) |

II. Accelerated Programs (1 year - 4 years)

III. Normal Programs (3 years - 7 years)

All the crisis programs are characterized by a sense of urgency. The Improvised programs differ from the Mobilization programs in that they pay relatively little heed to post-crisis legacy values of civil defense actions taken during the crisis. Improvised programs call upon hasty, temporary expedients to meet the imminent threat. The important thing is to cut red tape and get the job done, even at the risk of lives, and the expense of efficiency and possible fraud. The Wartime and Peacetime Mobilization programs are somewhat less urgent in that they represent an attempt to prepare for a generally deteriorated international situation, rather than for specific crises. The accelerated program is essentially a normal civil defense program, taking into account the fact that preparations have already been delayed too long. The normal program is a response to the dangers of the nuclear era,

but its pace is so slow that it appears almost pro forma. The seven programs are described in some detail.

All civil defense programs involve two important elements: 1. the prudential--i.e., the desire to protect the population and the country's recuperative powers if war should come; and 2. the strategic--i.e., the advantages and disadvantages arising from the increased CD capability and the implicit threat of still greater increases.

Preparation for Civil Defense Tactics

Any of the above programs can be thought of as consisting of two parts: (1) plans and preparations for survival, and (2) plans and preparations for the recovery and recuperation. Population survival, itself, breaks into two main components: (1) a shelter program for protection against fallout, and to some extent, against blast and fire; and (2) a population dispersal (evacuation) program supplemented by some type of fallout shelters.

Five alternative programs of preparation in anticipation of a shelter or evacuation program during a crisis are described in order of increasing costs:

1. Paper plans only (\$10-100 million)
2. Paper plans plus inexpensive preparations (\$.1 to 1 billion)
3. Paper plans plus modest preparations (\$.5 to 2 billion)
4. Paper plans plus moderate preparations (\$1.5 to 4 billion)
5. Paper plans plus extensive preparations (\$3 to 20 billion)

Paper-Only Preparation for Evacuation

Paper-only plans can be most valuable when funds are very limited. Such plans may save millions of lives, provide a pilot study for more elaborate programs, and demonstrate feasibility. Appropriate instructions would be stockpiled in various parts of the country and, during a crisis, the public would be made aware of their existence by radio and television, newspapers, and mail. Tailored to local survival needs, paper plans may include information about radiation threats, decontamination techniques, evacuation routes, reception areas, emergency shelter construction, survival supplies, communications, and so forth. Because a paper plan is both inexpensive and a necessary part of any planning, the paper-only plan is treated in some detail in the preliminary feasibility study (Chapter V).

Paper Planning Plus Inexpensive Preparations for Evacuation

Certain preparations of small cost greatly enhance the survival potential. One can cite, for example, the distribution of radiation meters, redistribution of emergency food stocks, and special warning systems. The plans would need periodic updating to accommodate new knowledge, changes in the strategic situation, and the growth of the ongoing normal CD programs. This kind of planning should provide a basis for the more costly options, which we termed Modest, Moderate, and Extensive.

Preparation for Recovery and Recuperation

A classification similar to the five-fold division of survival preparations in order of cost, is possible for recovery and recuperation preparations. For a thorough analysis, each of these five approaches would have to be considered with each of the seven civil defense tactics described earlier. Some illustrative examples and considerations are given.

Interactions

It is of interest to consider some of the interactions between the deterrent, prudential, and bargaining aspects of various improvised civil defense programs, as well as their effects upon the range of choices and attitudes open to Soviet decision-makers. A typical analysis of such interactions in a situation in which a large-scale conventional attack on Western Europe is being contemplated by the Soviet Union in the early sixties, is contained in Chapter IV. This analysis assumes the form of a rational Soviet strategist trying to think through the consequences of alternative U.S. responses to S.U. actions--especially responses which include one of the improvised civil defense programs.

CHAPTER V

The goals of this chapter are to determine the important elements of an illustrative evacuation plan as part of an improvised civil defense program and to ascertain whether particular difficulties or combinations thereof are insurmountable. Methods and techniques that would be involved in more detailed studies are examined. Obvious uncertainties in estimates and deficiencies in knowledge (e.g., weather, size and timing of attacks, behavior of individuals, etc.) are pointed out in each section. While the general aim includes considering specific situations with as much realism as possible in time allowed, the major object was to formulate problems for more study and to illustrate how detailed studies interact with general strategic considerations.

The plans provide for a certain amount of flexibility and hedging, to permit phasing old plans into new ones as circumstances dictate. Thus, a two-day evacuation plan does not simply scatter the population into slightly less dangerous areas, but it moves certain groups into designated reception areas. Then, if more time becomes available, it will be less troublesome to move the unscattered population into safer reception areas. Such tradeoffs preserve flexibility and may be of advantage when war is not believed imminent. The examples discuss some branching points at which choices must be made.

No crucial elements were encountered which, with suitable substitutes, would not make evacuation feasible. Some tentative conclusions can be drawn from the plans. In a week, it appears, there is sufficient transportation to move approximately 42 million inhabitants of the northeast into reception areas in that region. With a few days time, it seems feasible for them to construct basement shelters of some value against attacks considered possible in the sixties. If preparations are made, sufficient food appears to be available from grain surpluses to survive the attack and the immediate postattack period. People are not expected to panic in situations associated with the one-week plan.

Alternative Plans for Evacuations

Three illustrative examples of alternative evacuations are described in Section D, including (1) a two-day evacuation plan, (2) a one-week plan, and (3) a one-month plan. The two-day plan assumes the threat of an imminent attack and its goal is to evacuate the central cities of New York and Philadelphia, as well as Washington, Baltimore, Pittsburgh, Albany, Boston, and a few other areas, by auto and rail. There would not be sufficient time, however, to evacuate the metropolitan areas surrounding these central cities. The populations of these and other threatened areas would be expected to improvise suitable protection, as far as is possible. The plan is justifiable by priorities. The people believed most seriously threatened are, in effect, given priority on roads and rails.

The one-week plan assumes that at least a few days are available to complete the evacuation.

Since the timing of an attack is unpredictable an effective hedge is to extend the two-day plan when more time appears to be available. Such a two-day extended evacuation will result, however, in a less effective redistribution of the population at the end of one week than can be achieved by initiating a one-week plan at the outset.

In the one-month evacuation preparations are stretched out over a longer period during a crisis and the economy is less disrupted than in the shorter plans. The non-essential population leaves first, to be followed, if deemed necessary, by those remaining on an accelerated schedule. The population in probable high-fallout areas can construct shelters during the evacuation period, rather than move into overcrowded reception areas.

A detailed discussion of these plans with population density graphs before and after evacuation, and other supporting data is given in Section D.

EVACUATION AND RECEPTION AREAS

The planned evacuations in Chapter V are based on an assumed type and size of attack. Theoretically, the various kinds of attack with their associated fallout pattern would determine the choice of reception areas. In this study, for simplicity, the evacuation areas have been specified on the basis of a single hypothetical attack. When available time is believed to be too short to reach these fixed areas, the plans call for distant populations to improvise shelter in the hope of a later movement to the prescribed reception areas. Reception areas are listed and discussed in the sections appropriate to alternative plans.

Choice of Evacuation and Reception Areas

The proper choice of evacuation and reception areas must take into account the following factors:

1. Type and magnitude of the expected attack
2. Distribution of fallout and the blast protection existing or constructable
3. The "tolerable" radiation dose and required protection factor
4. Location of transportation facilities
5. Distribution of housing
6. The number of people to be evacuated
7. The availability of food and water
8. The prevailing weather

The reception areas were not chosen to minimize the effects of an unlikely appearing attack against the evacuated population. The one-week evacuation plan by itself represents, in the Northeast, a reasonable hedge against such population attacks. All evacuations discussed assume that the attacks are independent of the evacuation. Consequently, fallout from attacks on nearly empty cities is anticipated.

Magnitude of Attacks

For planning purposes a specific attack of about 4,000 megatons is assumed, thereby eliminating many random targeting choices which would be associated with a smaller one. More than 100 MT each are assigned, for example, to New York, Philadelphia, and Pittsburgh, and more than 30 MT each to Washington, Baltimore, Buffalo, Plattsburgh (N.Y.), and the Albany-Schenectady-Troy complex. About 30 other targets are located in Pennsylvania, New York, New Jersey, Virginia, and West Virginia. In the Northeast the total is in excess of 1,000 MT.

Fallout

Because of wind variations, fallout in some reception areas would be greater than in some evacuation areas. In an effort to minimize this effect, areas with low radioactivity under average winds were eliminated if small variations in wind would greatly increase the amount of fallout and if it appeared possible to move the population in the allowable time. The criterion chosen for permissible dose was 75r in two days or 100r in two weeks.

Protection Factors

The evacuations involve the states of OCDM regions #1 and #2, except for Ohio and Kentucky. In all these states, except Virginia and West Virginia, basements are estimated to be available in 90% of the housing. In the latter two states, which by our assumptions receive less fallout, basements are available for about 56% of the population. An average basement is expected to give a radiation reduction factor of 10 to 20. Where basements are available, a few simple measures, such as piling some earth on the first floor, sandbagging openings, etc., should give a protection factor of about 40. This factor is expected to be attainable within one week in the reception areas.

TRANSPORTATION

The evacuations described rely on automobiles to carry about 75% of the evacuees. In the densely populated New York-Philadelphia-New Jersey area the lack of roads into the prescribed reception areas suggests the use of railway boxcars. Busses, trucks, and rail passenger cars are given a role in the one-month evacuation plan. The use of barges was not considered because waterways in the Northeast do not lead into the desired areas, and also, because of ice formation several months each year. Figure C-1 summarizes the use of transportation in the plans considered here.

Evacuation by Automobile

The central problems associated with an evacuation by automobile are:

- 1) the capacity of the road system to distant reception areas;
- 2) the number of people occupying each car;
- 3) refueling requirements for the automobiles;
- 4) the breakdown rate; and
- 5) the weather.

The selected routes are shown in Figure C-2 and described in Appendix C-1. It is assumed, conservatively, that the evacuation routes will be capable of handling slightly better than 1,000 cars per lane per hour. With four persons in a car, 100,000 people will be able to evacuate over one lane in one day. Refueling will be assisted by emergency stations, gasoline trucks, and extra fuel carried in cars. The vehicle breakdown rate may be somewhat higher than usual.

Evacuation by Rail

Evacuation by rail has a number of advantages over evacuation by auto: trains handled by trained professionals, can easily run in poor weather; food supplies and medical equipment can be included; and doctors and nurses are more easily assigned. Each train of 100 boxcars is assumed capable of carrying 6,500 persons. It is estimated that from three to six times as many trains as normal can be accommodated. Evacuation by rail is based on a number of assumptions, listed in Section C. Train capacity limitations are tabulated in Fig. C-7 and evacuation routes are shown in Fig. C-8.

Trucks and Busses

In the region under discussion there are approximately 2,500,000 trucks and 68,000 busses (see Figures C-9 and C-10). Assuming an average capacity of 47 seated and 20 standees, the overall bus capacity is about 4.6 million. If all motor trucks, trailers, and truck tractors were useable and each passenger were allowed 10 square feet of space, the total truck and bus capacity would be about 27 million people. This could be raised to 68 million persons, if each were allowed only 4 square feet of standing space. Of course, not all trucks are useable (e.g., tank trucks, auto transports, etc.), nor are all in regions where they can easily be commandeered. The use of these vehicles for transporting people was not a part of the one-week plan.

Weather

The success of an evacuation can be hampered by extreme weather. Many factors must be considered, though none more obstructive than a snowstorm. Low winter temperatures would tend to cause discomfort. Frozen ground would make it difficult to improvise shelters with large protection factors. Current weather forecasting capabilities and a number of precautionary measures against snow and rain are described in Section C.

Evacuation Effectiveness

Computations based upon detailed map exercises yield the conclusions that an evacuation of the type considered here can give substantial protection against population attacks that are incidental to a general war; e.g., the destruction of several large cities because they are part of the military targets. Such evacuations provide much less protection against maximized thermonuclear population attacks or (possibly) against the use of other killing agents. The protection afforded the population depends on:

1. The degree of radiation protection (protection factors of 10, 20, 50, 100, and 200 are discussed).
2. The amount of time spent in the shelter (calculations are made for two weeks, one month, and two months).
3. The number of megatons diverted to population attacks.
4. The effective use of other lethal agents, such as chemical and bacteriological attacks.

Section D contains estimates of the population distribution before and after evacuation, and of the effectiveness of shelter protection against thermonuclear attacks for various protection factors and periods of shelter occupancy. In general, there appears to exist an intermediate range in the weight of the attack, for which the period of shelter occupancy is crucial in saving lives. It may also be concluded from the calculations that an attack of 250 megatons deliberately directed against the N.E. reception centers would kill between 15 and 50 percent of the evacuees.

Shelter and Ventilation

Fallout shelters for tens of millions of evacuees, with adequate protection factors can be constructed within a few hours or days, depending upon the area and season, with most of the work performed by the evacuees themselves. The plans described in Section E cover the construction of improvised multi-family fallout shelters, and inexpensive preparations for assuring sufficient ventilation.

Desirable and Attainable Protection Factors

Taking various considerations into account, a protection factor of 200 is a realistic goal for improvised shelters. If at least a day or more is available, small make-shift shelters need not be considered. Furnished with proper instructions, evacuees should be capable of constructing shelters with protection factors of 200 in from eight to 32 hours.

Ventilation of Shelters

For sufficient ventilation, 15-30 cubic feet of cooling air per minute per person are needed in humid/hot weather. Programs should either provide ventilating pumps or at least offer instructions to evacuees on making their own pumps quickly with available materials. Several novel suggestions for simple, inexpensive ventilating pumps are described in Section E.

Plan for Improvised Shelter Construction During a One-Week Evacuation Program

Section E describes an illustrative shelter construction plan, which is based upon the following assumptions: (a) mass education is effective during a crisis involving evacuation; (b) strong incentives exist for citizens in reception areas to assist the evacuees; and (c) survival supplies, such as austere rations, water containers, and ventilation devices (or information to build them) have been pre-stocked in the reception areas.

In the Northeastern United States the time required to improve the average basement varies greatly with the season. When the ground is not frozen, a basement shelter for 30 persons with a protection factor of 200, can be built by the evacuees in about eight working hours. This time would provide for: (1) clearing the floor above the basement; (2) shoring up the basement ceiling, and (3) covering the floor above the basement with a layer of earth 16 inches deep. When the ground is frozen, however, the attainment of the same protection factor would probably require several days labor, using ice for shielding.

The appendices to Section E of Chapter V describe other types of improvised group shelters that can be built within a few hours or days; some of these provide incidental protection against blast and fire. Some preliminary cost estimates are given.

Food and Water

Section F discusses important factors and preparations, such as relocation of food supplies, stockpiling in reception areas, likely difficulties in food deliveries during the postattack period, dietary needs, and possible substitute foods. Wheat is a preferred storage food. Also described (in Section F.3 and Appendix F.1) is an unconventional, partially tested shelter ration, consisting of wheat, salt, skimmed milk powder, and a multi-vitamin tablet, all packaged in a waterproof container. The ration is nutritionally balanced, provides 2,000 calories and costs 10 cents. Its high density permits efficient storage.

The water supply should not be critical during the preattack period, if simple conservation measures are observed. Paper plans can provide instructions for storing adequate water supplies in inexpensive containers. Likely locations of shallow wells could be suggested by advance geological surveys.

Medical Considerations in Crisis Evacuation

Section G presents some medical and health considerations during the evacuation phase, shelter period, and postattack phases. The removal of nonambulatory hospital patients is considered during a seven-day evacuation period. It is assumed that, under the threat of a nuclear attack, the normal 10% discharge rate from general and special hospitals can be stepped up to 15% of the total per day. Thus, by the end of the sixth day of the evacuation, ten per cent "hardcore" patients would remain; these could be evacuated by special trains and ambulances, or left behind as part of the population not evacuated. The greater portion of temporarily incapacitated people, confined at home, would be expected to recover in time to be evacuated.

Special decisions would have to be made about psychiatric and TB patients, who make up 57% of the total hospital population. Dangerous psychiatric patients or TB cases could be evacuated by special vans or trains, left behind, or evacuated last if time, transportation, and the reception facilities permit.

Normal admissions of seriously, but not critically, ill patients would have to be postponed. During the crisis those suffering serious injury would often receive first aid or temporary (hopefully competent) medication from laymen.

Emergency Hospitals -- To deal with accidents and serious illnesses, medically staffed first aid stations can, at certain costs, be set up at intervals along the major evacuation routes. In addition, special hospital trains (see Transportation) could be planned. These measures would serve to keep medical teams together as functional units. Various existing hospital disaster plans might also be modified to be useful during a crisis evacuation. As an alternative to keeping emergency hospitals "where the people are," a logistically simpler plan would consist of pre-positioning new and existing civil defense emergency hospitals in the reception areas.

Shelter Medical Supplies -- It would be desirable for each shelter to contain basic medical supplies for emergency treatment. Simply phrased medical information pamphlets are inexpensive and would assist this purpose.

Medical Self-Help -- The MEND medical self-help training program, conducted in cooperation with the U.S. Public Health Service, may be of considerable benefit in providing medically trained citizens. Such individuals, with a few medical supplies and instructions, could provide both medical assistance and morale to the shelter population. An acceleration of the current program would be relatively inexpensive.

Section G-3 of Chapter V describes a number of factors important in the postattack medical recovery process, both in the immediate and long-range recovery period.

Evacuation Command and Control

Command and control requirements for the one-week evacuation program described earlier are considered in Section H. The goals of command and control in an evacuation are listed below, in order of importance.

Planning Goals

1. Complete the evacuation in seven days.
2. Maximize the length of time evacuee can remain relocated.
3. Retain ability to evacuate a part of the unevacuated support.
4. Distribute evacuees to achieve adequate protection.
5. Minimize social and psychological distress.
6. Maximize the ability to return evacuees swiftly.
7. Retain ability to move evacuees to more distant (safer) than the programmed reception areas.
8. Minimize the costs of evacuation.

Command and Control Requirements

The evacuation system can be viewed as having four interlocking functions: planning, assembling, transporting, and relocating. The requirements and capabilities needed to fulfill these functions during a one-week strategic evacuation, and the underlying assumptions, are outlined in Section H. Also included is a sketch and a discussion of a plan which illustrates the various command and control requirements and capabilities. The general command and control philosophy is to delegate operating control to the lowest operating levels while retaining only the power to initiate the evacuation at the topmost level.

Arguments For and Against Evacuation

There are many arguments of various types for and against evacuation. Some arguments are concerned with the effects of purchasing or securing the capability of evacuation. Other arguments are directed toward the effects of having the capability. Finally, some arguments concern themselves with the effects of using the evacuation. Since an evacuation plan would be an important part of national policy, it may not be possible to determine the desirability of evacuation or even the relevance of the arguments for and against evacuation, without specifying various other aspects of this policy. An introductory discussion of the pros and cons of the different arguments concerning evacuation is presented in Section I.

Conclusions and Recommendations

This report shows that civil defense planning can design special systems for action to be taken during future crisis situations. The purpose of any of these systems would be the mobilization of the population for civil defense action deemed appropriate to the existing state of affairs. Chapter IV of this report discusses the general concept and the nature of the alternatives. Chapter V is a preliminary study of one illustrative tactic. Our first major recommendation is that a much more thorough feasibility study be made of each of a number of alternative tactics--alternatives which differ with respect to the degree of crisis for which they are designed and with respect to the nature of the protective action. Somewhat more specifically, in connection with this recommendation, we have been led to conclude that:

- A. At least seven degrees of crisis can usefully be considered, each of which has different requirements and thus suggests a different plan--at least in part.
- B. To be effective, such planning for crisis civil defense activity must be tailored to regional and/or local requirements. This is illustrated in Chapter V, for example, by the discussion of the nature of suitable improvised shelters for different parts of the country.
- C. With an appropriate set of plans, on paper only, which can be made available to the general population, more civil defense capability can be obtained in two days of extreme crisis than has been obtained during the fifteen years following the end of World War II.

- D. As part of their design, effective plans for any particular crisis will have some flexibility built-in, as a hedge against the possibility of unexpected change in the crisis intensity.
- E. This concept of planning for special civil defense activities during possible future crises, with the attendant likelihood of a large strategic impact in some situations, can lead to greater understanding of the future role of civil defense in national policy. Thus this concept should be disseminated to other departments to help establish mutual understandings and to obtain their reactions, criticisms, or support.

The second major recommendation we would like to suggest arises from the changes in public attitudes which follow developments in the international situation (a representation of which is given by the "fever charts" of Chapter IV) and from the difficulty which has been experienced in obtaining public acceptance of civil defense programs during non-critical periods. The Office of Civil Defense, as a department, should determine what preparations it can make, in anticipation of future fluctuations in international tensions, to be able to respond promptly and effectively to the requirements of an aroused nation demanding vigorous improvements in federal and state civil defense capability.

CHAPTER I

INTRODUCTION

The Problem

Most civil defense studies which have considered the interactions of warning and action to protect civilians have concentrated on what might be called "physical" warnings, e.g., bomb alarm systems, radar networks, air observers, etc. Except for its technical details and the intricacies of false alarms and other mistakes, this is a relatively simple problem since, when types of physical warning are under consideration, there is little need to take into account the feedback that certain civil defense activities may have upon the general strategic situation. Warning, however, may come from "political" as well as "physical" events. Political warning, even though ambiguous, may allow anywhere from hours to years for accelerating action to protect populations, whereas physical warning gives only minutes to hours. The strategy and tactics of exploiting such political warning will be developed in this report.

The very actions taken in response to political warnings are themselves political and in turn affect the world situation which gives rise to a warning. The question that is usually asked about political warning is, "How do we know which political events--whose implications are always somewhat ambiguous--require or justify taking protective action?" This question is difficult to answer but no more so than many others requiring decisions in today's world. Studies are needed to assist decision-makers in this task. Another and perhaps more important question is rarely asked: "What are the effects of taking protective action in response to various kinds of ambiguous political warnings?" There may be many unsuspected benefits in such an inquiry. Obviously, political and strategic effects ensue from certain kinds of protective actions taken in a crisis; e.g., evacuation or a crash shelter building program. Some of these political effects might be desirable, others undesirable. It may be possible to modify the program of protective action to increase the former while diminishing the latter. This should turn out to be especially true if the proper kinds of preparations, physical or political, have been made sufficiently far in advance.

In order to attempt to control the interaction of civil defense and foreign policy, however, one must analyze a range of major civil defense protective actions that might be taken in connection with the various types of international crisis that might occur in the next ten years. To perform this study, one should first select and analyze a wide variety of international crises. The crises considered might range in intensity or degree of tension from situations like the current Berlin problem, through a Munich-type situation, or a limited or a "phony" general war, to the kind of situation widely discussed by strategists lately, in which small numbers of nuclear weapons are used for "limited strategic retaliation" or political blackmail. One can then identify the major strategic and political effects that could result in each from taking different protective civil defense actions. Such investigations are greatly complicated by the fact that many different types of preparedness actions might be taken in advance of, or during a crisis which in turn have their reactions not only on the protective actions but upon the crises themselves. We must, therefore, consider the costs in economic, political, and psychological terms as well as the strategic effects of such preparations.

In addition to individual crises, certain tactics such as escalation and international bargaining must be specifically studied. Most important and at the outset all these problems must be considered in the light of the dominant U.S. strategic objectives. This report, which is visualized as the first of an ongoing series, will emphasize the formulation of the problem, available tactics, and the context within which the problem is important.

Context

It was mentioned in the preface that one of the continuing roles we visualize for the Institute, and for this Report in particular, is that of furnishing context for ourselves and others working in civil defense (or other aspects of national security). It might be useful to comment briefly on how a context or a general framework can be useful for such studies.

Elements of a General Context

Anyone performing a study needs an awareness of the limits within which his study is to be useful. That the world is basically a complicated and changing place is a cliché. Nevertheless, it is one which we frequently neglect. Most of us are so familiar with the world of past personal experience that it becomes difficult to imagine a world 10 years hence which, through gradual or sudden change, will be very foreign to us. Consequently we are often subtly trapped into the error of assuming the future to consist of elements of the present which are psychologically convenient. (Even science fiction writers almost universally have had their space ships "driven" by men.) In study projects involving problems of national security, if the research is to be useful it necessarily must be concerned with two questions: "What is the world really like now?" "What can the world be like in the future?" The fact that we have entered an age of rapidly-changing technology, as described in Section I of Chapter II, certainly complicates any effort to visualize realistically the world of the future--even a decade hence.

As we try to project the world into the future, we can see it unfolding in many possible dimensions. One dimension is the technological which raises such questions as: What will be the new technologies of the future and in what ways could they affect our civil life and our military weapons systems? Will we prepare to fight in space, under the sea, or within the bowels of the earth? To what extent will political man turn over control of weapons systems or other facets of his technology to the scientist or, even more to the point, to the computer?

A second dimension concerns the evolution of the political alignments of the world. Who can say whether the present bipolar world will persist, and if so for how long? When may there be three powerful blocs or four or five? How long will West Germany or France or even England remain a trusted, or at least a cooperative ally? What can be the significance of the growth of the oft-mentioned rift within the Communist bloc? Is it possible that there will be a realignment with Eastern and Western Europe combined in one bloc? Anti-Soviet? Anti-U.S.? Neutral? Is a rapprochement between the U.S. and the Soviet Union a feasible development within a decade or so? Does the United Nations have a chance to develop into a powerful

governing organization? These and innumerable other similar political questions lie before us when we try to see into the future, and some of them are reasonable and certainly not unreasonable possibilities.

A third dimension focuses on the arms race and the diffusion of nuclear weapons to many other countries. What happens if a crisis or even an accident escalates the arms race to the point where antagonistic countries are spending two or three times as much of their GNP as they are today on building armament systems? What may happen if a scientific breakthrough gives the S.U. a decisive, if temporary, military edge over the U.S.? What would happen if a country like China develops an immense conventional military capability and uses it to threaten the rest of Asia, thus confronting the United States with the problem of using nuclear weapons to contain them? What consequences may flow from a decision by the U.K. or other NATO members to declare neutrality or to disarm unilaterally rather than risk involvement in a future thermonuclear war? What developments are reasonably possible in arms control? To what extent is the manipulation of arms control agreements possible to obtain real advantages?

A fourth dimension concerns the nature of crises. This is elaborated upon by the escalation ladder and other considerations found in Chapter II of this report.

A fifth dimension makes us aware of the possible kinds of nuclear war, involving the possible duration of a war, the number and size of bombs which might fall, and the choice of tactics which would determine the location of the explosions. Civil defense preparations will be vitally affected by the assumptions about a future war in which nuclear bombs are used. Will such a war involve a quick, large, overwhelming pre-emptive strike, possibly destroying a country's military power and civil population; or will the attacks be limited or controlled in such a way as to restrict the size of the war or to avoid or minimize civil damage? Can the war be of low intensity and long duration? Can restraint be used in order to stop a war before it reaches all-out proportions? Is it reasonable to think of less than all-out wars as instruments for bargaining?

This brief paragraph on the nature of possible wars leads us to the sixth dimension, concerned with how wars can be terminated. To date this important problem has received very little study. It

is clear that if a thermonuclear war should ever occur, the question of termination immediately becomes a crucial one. Obviously, it becomes important at the inception of such a war, even where the number of bombs employed may be very small at the beginning--perhaps it is especially important in such a case. How much does the question of terminating a war depend on the hardware which belongs to our communications systems? How much does it depend on the kind of military equipment that we buy? How much does it depend on the political relations which exist among countries?

A seventh dimension brings us directly to civil defense, the nature and extent of the possible civil defense programs of the future and their effectiveness in various kinds of crises or wars. Will future programs be large or small? Will civil defense become an important part of our way of life? When and how do civil defense programs interact strongly with strategy and tactics? When are the interactions negligible?

The dimensions we have mentioned obviously encompass large subject areas. To understand them it would be necessary to subdivide them. Almost any item or sub-item or sub-sub-item which can be mentioned in this process interacts with almost every other one. And, unfortunately for the analyst, in many cases the interactions are very strong. Thus, these variables are not separable in the sense that they can be studied adequately one by one. We cannot study military systems without studying civil defense, politics, strategy, tactics, the nature of human beings, etc. Nor can we study the stockpiling of civil defense medical kits without studying its important interactions in the other areas such as shelters, kinds of wars, recuperation problems, and the like.

Stretching the Imagination

Even though innovation is the underlying spirit of research, all too frequently we encounter a lack of imagination, a refusal to consider the bizarre seriously, or a psychological blocking that prevents us from wholly attaining seeming problems. Consider the following parable:

The natives of Acirema, a south sea archipelago, face the prospect of being relocated to a new life in the Arctic. They refer this problem to their wise men who (never having heard of Eskimos) conclude that the environment cannot sustain human life. They present their logical proof:

"Up there, the body must be clothed all over the year round--most unhygienic." (They are unaware of the existence of a short, but hot and muggy, arctic summer with its swarms of biting insects.)

"There are no coconut trees, hence no coconuts. Surely one cannot live on fish alone. Anyway, swimming--and therefore fishing--will be impossible." (Of hunting they have never dreamed.)

"One needs shelter from the cold, but there is no thatch to build houses with. People will be caught in storms and surely perish." (One foolish native in desperation suggested houses of snow and ice--and quickly regretted it.)

The Aciremans did not know that the question was not one of existence but of numbers, adjustment, and comfort--of "How many?" and "How well?"

Faced as we are with future circumstances that defy the application of past experience, we have no choice but to stretch our imaginations and thus try to build up detailed images of many possibilities. Some will be quite bizarre but are worth exploring. Techniques such as "scenarios," "war and peace gaming" and the like can be used as aids in projecting ourselves into the future.

Using a General Context

This attempt to illustrate the magnitude of the problem raises the question, What can be done? How can studies be performed in view of the millions of possibilities in the unfolding future? After this introduction, perhaps the reader has been led to believe that he is about to receive a definite answer. The reply to such

hopes, of course, is that the reader will probably be disappointed. Nevertheless, we would like to make a few remarks which should illuminate if not clarify this matter.

First, we believe it is important in research to appreciate the basic nature of the complexities, some of which have been suggested.

Secondly, in his study an analyst should understand the full range of each dimension of the future with which his study interacts. It has been our experience that a conscious, deliberate effort needs to be made to combat the tendency to adopt too narrow a scope.

Third, it is insufficient if such context orientation is to be absorbed that it be merely read or heard. The text of whether the studying of the various possible dimensions and ranges has, indeed, occurred to a sufficient extent is that it will, after proper digestion, affect subsequent thinking.

Fourth, and this is a more specific remark, there are some ways of handling multi-dimensional problems which are better than others. Many studies have been too restricted because they are limited by a lack of appreciation of the wide range of possible variation of some parameters by the author or authors of the study. In such a case one might ask the question, how can you expect studies to be done beyond the range of what one understands? We believe that this is not a completely fair question. The suggestion made above is that the first task of the authors of a future study should be the stretching of their own imagination to increase the range of understanding. This may require them to write down all the important dimensions with which they will be concerned and then through study develop an awareness of the full range of each over which a selected parameter can vary. (For example, if the dimension is the size of a nuclear war, the parameters to be specified are the number and sizes of the bombs. This can vary from one bomb to, say, 100,000 bombs. Each bomb can range from, say, 0.001 KT to a doomsday device.) Of course, it quickly becomes apparent that the study must now be limited because, in almost every case, it is quite impossible to consider all of the important variations. Nevertheless, while the number of separate cases that can be studied are very much limited, usually the particular choice of cases can be selected in such a way as to make the study stretch over a large, interesting range of

the parameters. In those studies where more than one case cannot be considered, at least the authors can by appreciation of the broad general context be aware of the limitations.

The process of stretching one's imagination in order to gain a proper perspective calls for the development of both the range of all the important parameters and some understanding of the possible interactions among them. This is quite a complex task, and it would be expecting too much to ask each contractor to have the capability for doing an effective job in this area as a preliminary to carrying out the purpose of his particular contract. The Institute believes that it can contribute to the development of such a general context study which, in appropriate form, hopefully can be presented as a framework useful to others. Such a context, incomplete but fairly wide-ranging, is presented in Chapter II and, to some extent, Chapter III of this report. We believe that a perusal of these chapters and an absorption of their contents should provide many of the OCD contractors with a useful asset.

Developing an appreciation for a general context does not simplify the research in most cases. Rather, it will be considered by many as a complication. However, the purpose is not to simplify the task of the contractor, but to provide framework which, because it stretches his task in many relevant dimensions, determines final results which will be much improved and thereby benefit both the contractor and the OCD.

The development of a general context, then, is a very broad process in which one considers a range of important parameters in as many dimensions and sub-dimensions as can be reasonably handled and studies the interactions among these that are believed important.

This does not imply that in any particular study which is performed, say for the OCD, the studies themselves need be as general and broad in form as the framework itself. On the contrary, we believe that the proper form for most studies is to be very specific. For example, in Chapter V of this report we study the evacuation portion of a civil defense crisis program by considering a few very specific situations. We select the area to be evacuated; determine the population of the area; and determine specifically the reception areas in terms of their boundaries, their housing and shelter facilities,

their roads, railroads, stockpiles of supplies, and the like. Furthermore, to emphasize the specific nature of the study, we develop a specific context which specifies the year, the month, and even the day at which the evacuation is to begin and the state of world events which has led up to the evacuation taking place. In other words, we have specified within reasonable bounds, as strictly as we can for each of the pertinent parameters that bears upon the stated problem, a value within its range of possible variation. We naturally had to limit the problem out of consideration for the size of the contract and the time available to devote to it. In addition, because we may wish later to vary some of the parameters, we budgeted an appropriate part of our time and effort for the study of these variations.

In order to "properly" understand, say, the problem of strategic evacuation in crisis, it would be necessary to do a number of such studies in which each study selected a set of parameter values within the interesting range of variation which made it as different as is reasonably possible from each of the other studies.

We have found that when one specific study is done with a particular chosen set of parameter values one ends up understanding this problem within a surprisingly wide range of variation from the chosen values of some of the parameters. Therefore, if one studies a set of cases, it is possible to cover almost the entire range of possible variations of most of the significant dimensions, though one's knowledge or understanding will not be complete over these ranges. Nevertheless, when these cases are completed, it often should be possible to be aware, not only of what one has specifically learned and over which portion of the ranges of the important parameters has understanding developed, but also of which portions of which ranges have not been covered and whether additional study for completion is desirable.

Thus the methods we are advocating combines the broad understanding of the general context with the "harder experience" of studying problems in a set of specific contexts.

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CHAPTER IIDETERRENCE AND DEFENSE IN THE LATE SIXTIES
AND EARLY SEVENTIES (I)Introduction

We will consider, in this chapter, some aspects of deterrence and defense which are likely to set the context of our study of crises in the late sixties and early seventies. This chapter will concentrate on the special role likely to be played by military technology, and its effects on doctrine, strategy, tactics, and international relations. In a sense, we are adopting an almost Marxian view of the world, with military technology replacing the special role that Marx assigned to the means of production as the major determinant of behavior, and with conflicts between nations replacing the class struggle. In doing this, we will be conscious of ignoring and under-emphasizing the extraordinarily important developments that will be occurring in peaceful technology and in political, social, and economic areas.

Chapter III will balance this discussion, interrelating strategic, tactical, and political aspects of civil defense.

1. Technology and the Doctrinal Lag

In this section, we will try to get a feel for the intellectual and psychological problems of coping with the technological environment of strategic warfare by looking at three past and three future technologies. We will review the three technological revolutions (2) we experienced since World War II and the way doctrinal lags have dominated our thinking during most of this period.

A doctrinal lag can be defined as a failure to change ideas in response to changing circumstances. Ideas which may have once been appropriate, such as "wood is cheaper than metal," "train travel is faster than automobile travel," "men on foot can't defeat armored knights on horseback," etc., become inappropriate. As technology or other circumstances change, the old doctrine, unless revised, becomes wrong and leads to bad planning. In the modern age, unless heroic efforts are made, changes in doctrine seriously lag behind changes in reality. This part of the briefing will give examples of why doctrinal lag has become chronic and overwhelming in postwar national security planning. The objective of giving this account is to brace and motivate ourselves for the unpleasant and difficult experience of trying to avoid or decrease these lags.

A. The 1951 Setting

TABLE I

1951 TECHNOLOGY

B-50 and B-36 form backbone of U.S. SAC
Experimental aerial refueling
Initial production of B-47
First flight of XB-52
Manual air defense system started
Air defense has F-80, F-94, F-86, F-84
Production order for Nike-A
Nuclear powered airplane under development

Third or fourth generation atomic bombs

Russians have TU-14, MIG-15, and have tested three nuclear weapons

Air Research and Development Command, Lincoln Lab.; RAND Corporation, etc. established

Table I is a brief summary of the technology of air warfare in 1951, only six years after World War II. The Strategic Air Command (SAC) has completely replaced its wartime bombers with new postwar bombers; it has started production of an all-jet bomber, the B-47; and the first flight of the B-52--the next generation all-jet bomber--has already taken place. The United States, feeling the need for protection, has started a manual air defense system with all-jet fighter aircraft. Production orders have been given for Nike-A Missiles, which, together with the jet fighters, represent advances that would have taken a terrible toll of World War II bombers. The United States is taking intercontinental bombing seriously by its emphasis on the development of new and novel operations such as experimental aerial refueling. Finally, it is looking toward the distant future in developing such devices as the nuclear powered airplane.

These advances support the statement that by 1951 we have achieved a technological revolution in the art of war compared to the 1945 state of the art. A war in 1951, thus would have been fought with brand new equipment. In a sense, this is an historic occasion. In the history of war, one cannot find any examples of as complete and thorough across-the-board replacement of old equipment with new equipment based upon a brand new technology between wars. The year 1951 is typical of the new era in which there is the introduction, full procurement, obsolescence, and phasing out of complete weapons systems without their ever having been used in a war. This era was heralded in World War I and World War II, but in neither war was the break with previous wars as large or as complete as that between the end of World War II and a war that started in 1951. For example, the German use of tanks and planes had been anticipated by the Allies, who had planned similar operations for use in 1919 if the war continued. Similarly, the trench warfare of 1914 was clearly presaged by the American Civil War and the Russo-Japanese War. There were some mild improvements in internal combustion engines, electronics, and some new equipment. Similarly, World War I started where the Russo-Japanese War and the Civil War left off. The tendency was held true throughout the history of warfare. What changes did occur were nowhere near as dramatic as those between 1945 and 1951.

It should be clear from the foregoing that concepts and doctrine derived from World War II experience might have applied to the strategic situation in 1951 as poorly as some outmoded American Civil War concepts would have applied to World War II--even without taking into account the most important development of 1951.

The startlingly new technology available in 1951 is, of course, the fission bomb. By 1951 we already have third or fourth generation models. It is fair to say that the difference between one generation in the atomic bomb is larger, for example, than the difference in artillery between the beginning and the end of World War II--the kind of difference one saw between a Model T and a Model A Ford, or even between a Model A and today's Ford. Spectacular as the development of such nuclear weapons was, the question of whether their use would have been decisive in a 1951 war between the Soviets and the United States is still controversial. The Soviets at the time did not think so. They talked rather smugly of "permanently operating factors" and the impracticality of blitz-krieg tactics.

Severe limitations on the number of nuclear weapons were assumed to be due to the scarcity of uranium--a view which was reinforced by most of the technical people. For this reason, almost all discussions about defense against nuclear weapons assumed that bombs were, and would continue to be, too precious to be used on anything but important cities or the most extremely lucrative production targets such as Oak Ridge or Hanford. Similarly, NATO planning was based on the assumption that nuclear weapons would not be generally available for the European theater except for very special and high-priority targets.

Not only had doctrine lagged behind 1951 technological possibilities, but, aside from a very small group of people in the AEC, almost no one even speculated on what five or ten years of intensive developmental research might do to make nuclear bombs smaller, more powerful, and cheaper to produce in quantity. Even AEC experts underestimated the flexibility, efficiency, and economy soon to be available in the ordinary atomic weapon; and nobody even remotely foresaw the developments that would occur in thermonuclear technology.

This doctrinal lag in the late forties and early fifties had many effects. For example, such planes as the A3D and B-66, which were designed as optimal atomic bombers, were fitted around the 60 inch, 10,000 pound bomb, even though much smaller and lighter bombs were already available when the design was laid down. Some studies of the ICBM also assumed it had to carry 60 inch, 10,000 pound bombs. These studies, of course, concluded that this would not be feasible within the rocket technology likely to be available. This is one reason why ICBM's were de-emphasized. In the Soviet Union, a number of enthusiasts for high-thrust rockets prevailed. The Soviets pushed rocket technology, not as a result of systematic studies, but simply because they believed it was a "good thing" to push the state of art in order to have "on-the-shelf" components available.

The most important doctrinal lag in 1951 concerns the possible ground vulnerability of our strategic force. At this time all of our bombers were stationed on about twelve bases. It would have taken many hours even to get the planes in the air and very much longer to dispatch them on a mission.

The Soviets by this time have tested three nuclear weapons and presumably have a stockpile more than sufficient to knock out these twelve SAC bases. They have also exhibited a plane, the TU-4, which, with refuelling, could have made it from the Soviet Union to the United States on at least one- or one-and-one-quarter-way missions. We have absolutely no kind of warning systems or active defense in 1951. What active defense we have is concentrated around laboratories and the big cities. In principle, it would have been possible for the Soviets to have attacked these bases and to have destroyed our strategic force almost completely while it was on the ground. As a matter of fact, by dropping an extra bomb or two they could also have destroyed our atomic stockpile. (3)

This lack of concern for the ground vulnerability of our bombers is surprising. Many people had written or lectured about the importance of our having a secure and invulnerable SAC. Furthermore, it was part of both the Douhet and Air Force doctrine that war in the air is decided by the destruction of the enemy air force on the ground. And less than a decade has passed since the "bolt out of the blue" at Pearl Harbor. Nevertheless, there is a real doctrinal lag in 1951 (which was just understood by 1956, and being overcome by 1961). Rather interestingly, it was the advent of the ICBM which made the problem crystal clear, and not the fact that the Soviets had acquired a strategic bombing force. It was the advent of the ICBM that persuaded most people to think the vulnerability problem through and learn to distinguish between first- and second-strike forces. As long as the problem has any subtlety at all, most people manage to ignore it. One wonders what "subtle" doctrinal lags exist today.

Of far reaching importance in 1951 is the establishment of the Air Research and Development Command (ARDC), Lincoln Laboratory, RAND Corporation, and other organizations whose purpose is to stimulate, rationalize, and institutionalize research, development, and innovation. In effect, they accelerate technological progress and make innovation almost automatic. Previously, whenever we had new ideas coming into a military service, there was a controversy. There were conservative and radical views. Today our R & D machines grind out innovations continuously. It is somewhat like having a compulsory educational system. Once you establish such a system you get educated people; they all have some kind of education; the only question is, "What Kind?". We have established a system for research, development, and innovation, so we can now expect research, development, and innovation.

B. The 1956 Setting

Let us now look at the technology of 1956. Table 2 shows some of the outstanding developments.

TABLE 2

1956 TECHNOLOGY

Last B-47E produced
B-52 and KC-135 phased in
B-58, Snark, and XP6M-1 (Martin Seamaster) fly
Regulus 1 in service
Atlas, Titan, and Thor in crash programs
Century series of fighters phased in
Missile Master and SAGE in production
Atomic plan and rocket under development
Atomic powered submarine launched

Russians have Badgers, Bears, Bisons,
IRBM's, H-bombs

Inexpensive flexible atomic bombs
Third-generation thermonuclear bombs

Nineteen fifty-one saw the initial production of the B-47. Nineteen fifty-six sees the end of B-47 production (in a much improved E version) and the mass production of the new jet bomber, the B-52, which had its first tests in 1951. The new jet tanker, the KC-135, is also being phased in. The next generation of air-breathing craft, the B-58, the Snark, and the Seamaster, are all being tested, but will never be produced in quantity. While they embody very impressive technological advances, they are bypassed by even more impressive developments. The Regulus 1 is in service, and Regulus 2 is under development. But these too will be outpaced by the emergence of the ballistic missiles. The Atlas, Thor, and Polaris missiles are in crash programs, and the possibility of 30-minute blitzkriegs is becoming conceivable.

Air defense is greatly strengthened by the Century series of supersonic fighters and the surface to air Nike-Hercules missiles. The new Missilemaster and SAGE control systems are in production. These new techniques for active defense would have almost unquestionably made World War II attacks prohibitively costly. In World War II, five percent attrition was considered an unacceptable loss for most raids. This new equipment would probably have done much more than this against World War II equipment and techniques. In fact, it would have been rather potent, if fully phased in and operational, against the attacks

possible in the early fifties, but by 1956, the new air defense is being made partially obsolete by new developments before it is fully deployed. This is less because of basic inadequacies in the new equipment than that the system has not been properly designed to meet the environment it will have to operate in.

For example, none of our air defense installations is being prepared for the missile attacks which will soon be possible. In fact, many of these new installations will end up being located on SAC bases--for example, nine of the twenty-one SAGE centers and the most vital nine at that: two on the East Coast, five on the Canadian border, and two on the West Coast. Hence, the system is being built so that, if a missile attack is launched against SAC bases, an important part of air defense will be destroyed without firing a shot.

Among the more esoteric projects under way in 1956 are atomic planes, rockets, and submarines. The last has just been launched. This atomic submarine proves highly significant--much more successful than many expected--but the other atomic vehicles seem likely to be less successful and, at least so far as the early sixties are concerned, are outpaced by new developments.

Since the Russians have Badgers, Bears, Bisons, IRBM's, and H-bombs, deterrence is beginning to be a two way street. Most sophisticated observers will soon believe that we either are, or soon will be, almost as deterred from initiating the use of nuclear weapons against the Soviets as they would be in initiating their use against us. Some important distinctions between vital and "vital" now come into being. However, the real understanding of the need for a wider choice than holocaust or surrender is not understood or at least does not affect policy much until the Kennedy administration.

Atom bombs are now quite inexpensive, flexible, and readily available. However, there has been a curious doctrinal difference between us and the Soviets on the use of atom bombs. One Soviet report regarded atomic bombs as too expensive to be used against submarines at a time when some Americans were seriously planning to fire them at tanks.

Again, these advances taken together justify the use of the term "a complete technological revolution" in the art of air warfare in the five-year period between 1951 and 1956. Yet these advances pale into insignificance when compared to the really big revolutionary development--thermonuclear power. Before going on to the 1961 revolution, we will examine in some detail the effect of this development.

The Effect of Thermonuclear Power

The development and perfection of thermonuclear bombs makes the 1956 technology a striking watershed in military history. This probably introduced a more radical change than the introduction of the atom bomb itself. The difference between megaton and kiloton is very large indeed--larger in important ways than the difference between kiloton and ton. While the kiloton bomb was a staggering experience and a shock to military thinking, the strategists soon began discussing how it could best be used in a war--whether to attack industry, population, buildings, military targets, railroads, and the like. The megaton bomb produced such a severe shock that tactical and, to some extent, strategic thinking almost stalled. The first reaction was that one cannot fight "rational" wars with megaton bombs; all one can do is to blow up a major portion of the world. The sheer difficulty of trying to think through the problems posed by megaton power was so great that thinking was blocked and the likelihood of an uncontrolled war automatically increased. Actually one might have conjectured that the introduction of such lethal weapons would have made analysts and war planners think harder but the psychological and intellectual climate was dominated by the so-called "spasm war" concept. It was not until the late fifties that strategists began to talk again about "controlled wars" and only very recently that this concept actually influenced policy and procurement.

The effect of the innovation shows up in the nature of the questions one tends to ask. For kiloton bombs, one asks: How much is destroyed? For megaton bombs, one asks: How much is left? Barring an extreme course of military events, few doubted that the nation would continue in some form after a kiloton-level of attack. However, if multimegaton weapons are used, the question of the continuation of the nation (or even of civilization) is seriously raised. Megaton weapons are comparable to gross forces of nature such as earthquakes and hurricanes. The effects of the use of such weapons, beyond being extremely widespread, can be very suitable and hard to predict.

Indeed, multimegaton weapons are so powerful that, even if they do not destroy a system by blast, they may damage it by some subtle effects or so change the environment that the system will be temporarily inoperable. Indeed for the first time in the history of war we face what might be called the problem of the post attack environment--a real danger that both the short- and the long-range environment in which we operate our weapons systems and conduct our recuperation will be very adversely affected.

These effects of nuclear weapons include blast, thermal and electromagnetic radiation, ground shock, debris, dust, and ionization--any one of which may affect people, equipment, and the propagation of electromagnetic signals. (4)

With kiloton bombs, for example, it isn't clear that a war would necessarily be short. It would be difficult with only kiloton weapons and the equipment we had in 1951 for the United States to do as much damage to the Soviet Union as the Germans did by their invasion in the first summer of the campaign. With megaton bombs directed at cities, the length of a war is almost an academic question--there is no longer a possibility of war production of any magnitude if an enemy tries to prevent it. This creates a curious situation. Since one can destroy cities so easily, in a sense they are no longer valuable military targets. In World War I and World War II, civilians and their property were important because they produced war goods, soldiers, and morale; in a 1956 World War III (or later), once both sides deliver enough megaton weapons, a war is likely to be over. At least, the kinds of wars most analysts study are short, lasting somewhere between 30 minutes and 30 days. In that short period of time no nation is going to produce much war goods, draft many soldiers, give people a chance to vote, or worry about public morale. Because one can destroy people and property so easily, they are no longer priority targets. (5)

Practically nobody realized the full implications of this in 1956. War plans drawn up in peace time can be startlingly inappropriate. For in peace time hardly anyone, including the average military planner or professional analyst, thinks very deeply about war--at least in realistic terms.

Megaton Implications for Society and Tactics

The megaton bomb gives scientific respectability to the notion of Armageddon as the likely result of a war. This possibility was raised as soon as kiloton nuclear weapons appeared, but the prognosticators didn't really mean it then. However, in the mid-fifties and late fifties almost every public statement on war by scientists used phrases like "end of history," "end of civilization," "end of all life," and so on. When they used these phrases, they either had made calculations or thought they had made calculations, which indicated to them that this was a perfectly reasonable estimate of the situation--that is, many of these scientists had done some homework. If there had been an argument between a non-scientist who said, "Now look, human beings are tough; they rise to the occasion; we've suffered wars in

the past in which many people were killed and we've always been restored," and a scientist had replied, "No, it isn't like that, this is different," by and large, the scientist who held the "end of history" side would probably have won the argument. Nonetheless he was probably wrong. He was certainly wrong if he believed he could prove it.

Scientists at RAND examined every reason for believing such statements and, as far as they could tell, if civilization did not survive the kind of war that would have been fought in the mid-fifties (I want to emphasize the term mid-fifties), they did not yet know the reason for it. A thermonuclear war, unprecedented and catastrophic as it would be, would not have been literally "annihilating" under more circumstances to both antagonists, and certainly not to the world.

The thermonuclear bomb does raise the technological possibility of total annihilation. Indeed, it makes it technologically feasible as a potentiality. That's important too. Again, one ought to make an important distinction. Today the Soviet Union and the United States probably have enough weapons in their stockpiles to kill everybody in the world, if their weapons were properly delivered. This is not a startling thing. In wartime there are enough bullets in the armories to kill everybody, but you can't get all the people lined up. You can make enough bacilli in your basement to kill everybody, but you can't get a microgram on each man's tongue. There are enough kitchen knives in the world to cut everybody's throat, but such knives do not constitute a military weapons system. Destructive as the late-fifties weapons systems were, these systems could have annihilated everybody in the modern world only if the Soviet Union and the United States cooperated in the attempt, i.e., interchanged bases, and worked with each other not to interfere with the operation. Such cooperation might be possible but is hardly probable. However, it is also important to make the point that the situation may change. (6)

All of the above leads naturally to Table 3 which raises the important questions and lists problems which have to be studied and which should have figured largely in strategic thinking during the period immediately following 1956.

TABLE 3

THE EFFECTS OF MODERN WARFARE

A comprehensive analysis of the thermonuclear war would investigate:

1. Pre-war preparations
2. Kind of war
3. Blast and prompt radiation
4. Thermal radiation and fire
5. Acute effects of fallout
6. Post-war survival
7. Reorganization
8. Rate of recuperation
9. Medical after-effects
10. Social after-effects
11. Genetic effects

The effects of the megaton bombs on society are even more complicated and complex than on weapons systems. Any decision-maker contemplating war in 1956 would have had to consider seriously every item in Table 3. It is clear from the table that those responsible for waging or risking a modern war should be as much concerned with bone cancer, leukemia, and genetic malformations as they are with the range of a B-52 or the accuracy of an Atlas missile.

Yet, if one had presented this table to decision-makers and asked, "Are you familiar with this list of problems? Do your current study documents and plans reflect deep thought or even any thought about these most critical defense problems?" the answers to both questions would have been almost unquestionably "No." This was particularly startling because almost every scientist who expressed an opinion at this period indicated that he thought that consequences of such problems as 5, 6, 8, 9, and 11 would be absolutely overwhelming, i.e., a nation might be overkilled five times.

It is true that, for example, the RAND study (7) of 1957-58 examines in detail why many scientists thought that these five problems would be overwhelming and found reasons for believing that these views were either too pessimistic or wrong. However, the study also showed that this is not obviously so. The findings depended upon details such as the exact chemistry of Strontium-90, the lifetime of Carbon-14, and so on. In other words, the pessimist could have been right. Even more important, it really is now a question of degree. It is possible to build doomsday machines

or military systems which would in fact destroy a nation totally. In any case, the RAND study was admittedly a superficial study; it did not attempt to delve deeply into any of the subjects at which it looked. Basically, all it tried to do was correct misconceptions and formulate plausible arguments. It is a rather surprising thing that in the four years since this study was done there has been relatively little over-all work of this sort which would refine or deepen these conclusions, though there is now much work in progress which should result in exactly that. It should be realized that it is important to have some understanding of all the above effects. This may become even more important in the future if we achieve any degree of implicit or explicit arms control.

It is generally the purpose of an arms control agreement to reduce the damage of a war most often by reducing the number of weapons available. This could mean that neither side would possess an overkill capability. Therefore the exact details of how much kill they really possess are important. This leads again to detailed considerations of the points set forth in Table 3.

Let me conclude references to this table with a discussion of the second point, What Kind of War? Even here I wish to concentrate on how the kind of war could depend on the objectives chosen by the attacker on his first strike. While many things influence the kind of war that could occur, one of the most important is the objectives.

A set of such targeting objectives is shown in Table 4.

TABLE 4

DIFFERENT TACTICS

1. Countervalue
2. Countervalue - Counterforce
3. Straight Counterforce
4. Counterforce - Bonus
5. Counterforce - Avoidance

1. The Countervalue Attack. The attacker may try to destroy those things which the defender prizes most highly, regardless of whether such destruction helps the attacker to achieve an immediate or essential military objective. Presumably, nations prize people and property most highly. (8) Therefore, the most likely countervalue attack would be made against the cities which contain the greatest concentrations of people and property in a manner designed to cause the greatest possible number of deaths and injuries and handicaps to recuperation. For example, an attacker might deliberately attempt to achieve massive blast and thermal effects with missiles and warheads of the highest megatonnage available.

Attacks concentrated upon people and property are likely to be based only upon a countervalue motivation. Massive destruction of people and property is not likely to achieve any immediate or essential military objective. It would be more important militarily, for example, for an attacker to try to destroy forces which can hurt him in immediate retaliation. Most experts agree that, unlike World Wars I and II, any future wars are likely to be short and fought only by military forces in existence at the time the wars start. Moreover, the potential fallout, which could force the surviving civilian population to seek shelter in any event, makes it even more unlikely that problems of civilian morale would handicap the defenders' military operations during the war. Lastly, and probably most important, the surviving civilian population may be valuable hostages in deterring retaliation and in achieving political objectives, including the enforcement of peace terms without further mass violence. The fewer cities destroyed, the more hostages would be available for this purpose, and the likelihood of irrational and self-destructive responses caused by anger and a desire for revenge would be diminished. Moreover, since the number of usable delivery vehicles--bombers and missiles--may be limited, any vehicles "wasted" on cities will be unavailable for their primary mission of destroying the defender's retaliatory forces. In other words, attacks against people and property are likely to be counter-productive.

In spite of the above, it is generally easy for most laymen and some experts to believe that a city-busting attack would be the most likely beginning to a thermonuclear war. Visualizing themselves as the defenders, they naturally think of the attacker as vindictive or malevolent, and interested primarily in hurting them. But it is irrational for an attacker to ignore his own priority of interests in order to hurt the defender.

It would be even more irrational for the attacker to divert most, or a large portion, of his defense budget to weapons systems (such as ICBMs carrying 100 megaton warheads) which would be difficult to protect against enemy attack and which could be used only to injure the interests of the opponent rather than to advance one's own interest. Such a system might be able to cover almost every square centimeter of the inhabited territory of the U. S. or S. U. with blast and thermals, but it would not be usable in the kinds of discriminating wars that we discuss later, or would it even be very effective in destroying the opponent's counterforce. In fact, the attacker should not be nearly so interested in hurting the defender as he should be in the dual objectives of achieving his own military objectives and escaping destruction himself.

Of course, if a country is only interested in deterring attack against itself, the arguments for an announced counter-value strategy might be increased. (However, in some circumstances, the lack of credibility of the strategy, might lower its deterrence value). However, it is interesting to note that the United States will probably be able to deliver less total megatonnage in the mid-sixties than it can today because of the shift in emphasis from bombers and big missiles to Polaris and Minuteman. These small missiles are desirable not only because they are less expensive, but also because they are easier to protect by either mobility or hardness; i.e., they do a better job of deterring attack than big missiles. In any case, most experts now doubt that a surprise attack is likely to involve an all-out concentration on people and cities.

However, an exclusively countervalue attack could occur as a result of a doctrinal lag or irrationality. In the early sixties the Soviets might be able, by devoting all their striking power to such an attack, to inflict as many as 50 to 100 million casualties upon the United States. If we do not acquire elaborate and expensive systems of active and passive defense, it will no doubt be technically and economically feasible for them to procure systems which could kill between 75 and 100 per cent of our population by the mid- or late-sixties in a first strike. Even assuming we develop and install elaborate and expensive systems of defense, there would be considerable uncertainty as to the effectiveness of such systems if the Soviets are vigorous in developing offensive techniques and systems. Many experts believe that by the mid- or late-sixties there will be no practicable defensive measures which would enable us to save most of our population in the event of an all-out attack solely upon it, other than a permanent and disciplined alert status for everyone--civilian and military--and even more elaborate and expensive physical preparations.

Fortunately, an all-out surprise attack in which all resources are devoted to countervalue targets would be so irrational that, barring an incredible lack of sophistication or actual insanity among enemy decision-makers, such an attack is highly unlikely. However, as discussed later, small countervalue attacks, initiated by us or by the Soviets, are not as highly unlikely as moves in the international game of "chicken," or as desperate alternatives to all-out thermonuclear war.

2. Counterforce Plus Countervalue. The next kind of attack to be examined is a mixed attack against both our strategic forces and the things we value most highly. The objects of such an attack might be divided approximately 50-50, or possibly less symmetrically. This type of attack corresponds to the picture most experts had of war until quite recently. This was not because historically most wars have been fought this way (historically they have not). Nevertheless since wars of the last 100 years--the Civil War, World War I and World War II--were fought this way and since the notion of a "nation in arms" is visualized as the proper way to wage war, the possibility of such an attack must not be discounted. If either side refuses to "think about the unthinkable", then "old fashioned" ideas may prevail.

As we have previously pointed out, unless the attacker has an overkill capability with respect to the defender's strategic forces, the mixed attack is likely to be a great mistake. If the attacker lacks the capability to destroy totally the other side's strategic forces, he should not waste resources attacking his opponent's cities. If, on the other hand, he wishes only to punish the other side, there is probably no reason for hitting the other side's military forces in addition to his cities unless such destruction of forces contributes in some desirable way to peace negotiations, or the state of the post-war world, or some other useful objective.

3. Straight Counterforce. In the third kind of attack, the attacker ignores the things which the defender most values and concentrates on those targets which may be used to hurt the attacker most immediately to retaliation. A straight counterforce attack is a reasonable tactic and quite likely to be chosen if the planning is determined even by narrow military considerations. There are also strong political considerations in its favor. Whoever launches a surprise nuclear attack will have to justify it to his own people and to future generations. Since the probable justification would be that they had to beat the other side to the punch, a relatively humane attack might help to reinforce the argument. In the early 1960s a straight counterforce attack by the Soviets might well result in 1 to 20 millions

dead, under conditions of a vigorous civil-defense program; or 5 to 30 million dead, assuming a modest civil-defense program; or perhaps 10 to 50 million in case we had no program worth talking about. In the middle and late 1960s, if the Soviets should increase their force and we should disperse hard missile bases throughout the country, these estimates might have to be multiplied by as much as five.

4. Counterforce and Bonus. In the fourth kind of attack the attacker has basically the same attitude toward the military importance of cities that he had in the third; however, he feels it desirable to destroy as much of the other side's civilian population and property as he can, though not at the cost of decreasing significantly the military efficiency of an attack concentrated upon the defender's strategic forces. An attacker might want to obtain a "bonus" to foreclose any possibility of a long war, to prevent or lessen postwar competition, to be revenged, or simply to be malevolent. He might also have an obsolete doctrine, or even some reasons which he could not articulate, but which might still seem sufficient to make him accept a modest decrease in military efficiency over the straight counterforce attack. To obtain a "bonus" the attacker could move the designated ground zeros slightly, use the largest workable weapons, and in other ways greatly increase bonus damage to civilians and property without materially decreasing the efficiency of the counterforce operation. This attack can be combined with "post attack coercion" by deliberately sparing some, but not all, of the hostages.

Such an attack would result in quite different casualties and damage from that of the straightforward counterforce attack, though the primary targets would be much the same. Depending upon the details of the capabilities and tactics used in pursuing a counter-force-plus-bonus attack over that of a straight counterforce attack, the casualties might be increased by factors of 5 to 10 in the lower ranges (1-10 million), and by factors of 2 to 5 in the higher ranges (10-50 million).

5. Counterforce Plus Avoidance. In this last type of attack the attacker's attitude and objectives with respect to counter-value targets are the opposite of his objectives in the counter-force-plus-bonus attack. The attacker actively wishes to avoid destroying the defender's population. He may be motivated by moral or political reasons because he wishes to hold hostage as many as possible or because he wishes to avoid unnecessary provocation. If an avoidance objective is pursued vigorously, an attacker might accept some relatively large potential military disadvantages. For example, should there be a SAC base near a

major U. S. city, then, rather than drop a 20 megaton bomb on it, he might avoid the base completely or he might compromise and drop only 100 kilotons. (In most circumstances 100 kilotons are likely to be almost as effective in destroying the SAC base as a 20 megaton bomb and far less damaging to the nearby city.) It has been estimated that a counterforce-plus-avoidance attack on the United States in the early sixties might result in as "few" as one million casualties. It would almost certainly be less than five million so long as the attacker is careful, no weapons go disastrously astray, and we have a modest civil defense capability.

In an actual war, which of these five types of attack might we most reasonably expect? I have no idea. There is nothing in law or logic that says we or an enemy has to be reasonable. However, by the mid- and late fifties, at least as far as the side which strikes first is concerned, only the third and fifth attacks--the straight counterforce and the counterforce-plus-avoidance--seem to make sense, and in most cases the last is to be preferred. In spite of the fact that the other three types of attacks involve either a waste of resources or an unnecessary and likely self-defeating brutality, almost all discussion in the middle and late fifties emphasized these irrational and self-defeating attacks. In the U. S. the doctrinal lag was just beginning to be made up in the early sixties (9). It should be mentioned that the side which strikes second (the side presumably trying to deter the war), might in fact wish to appear committed to an all-out countervalue response. It might best deter the attack by this appearance of irrationally inexorable commitment. If deterrence fails, however, it would then be irrational to carry through the commitment. In most people's value system, revenge will have a lower priority than survival. One would wish, if one could, to revoke the commitment after the first attack and use whatever force has survived the aggressor's strike to prevent further strikes and to terminate the war on the best terms possible. This implies that the defender should rationally concentrate his attack on counterforce targets, perhaps withholding some forces to increase his future negotiating strength (10). Alternatively, he might attack countervalue targets according to the concepts of controlled reprisal to be discussed.

There is also some advantage in not using too extreme a "rationality of irrationality" strategy. If the enemy suspects that one may not reply with an all-out countervalue retaliation, the original attack might be made carefully (counterforce-plus-avoidance) and combined with a reasonable peace offer. Such care would not cost the attacker much and might buy him a great deal if it were to induce the defender also to be careful. This

knowledge or expectation, even if weak or uncertain, might motivate the attacker to adhere to a counterforce-and-avoidance objective. While this expectation on the part of the attacker might weaken the defender's deterrence, it might not weaken it much. It is unlikely that an attacker would be so willing to rely on these expectations as to be induced, in normal circumstances, to attack.

C. The 1961 Setting

TABLE 5

1961 TECHNOLOGY

- * Arms control (techniques and effects)
- * Experimental nuclear explosives for peaceful objectives
- * Satellites (Vanguard, Pioneer, Discoverer, Tiros, Transit, Notus, Mercury, etc.)
- * Soft Atlas and soft IRBMs deployed
- * 25 PSI Atlas, 100 PSI Titan, BMEWs, and Polaris being phased in
- * Crash program on Minuteman and other second generation missiles
- * Guidance breakthrough
- * B-47E, B-52G and H, B-58A or B form bulk of SAC
- * Bombers operated alert and dispersed
- * SAGE and Missilemaster partially deployed
- * Bomarc and Hawk being phased in
- * Nike-Hercules, F-100, 101, 102, 104 in service
- * Cheap civil defense?
- * Inexpensive, efficient, and versatile nuclear weapons
- * There are four nuclear countries
- * Goose, Navajo, Regulus II, F-108, etc., cancelled
- * Canada cancels CF-105 (1959), British cancel Blue Streak missile (1960)
- * Nuclear-powered plane and rockets still under development
- * X-15 test vehicle
- * Russians have

Although Table 5 was drawn up in 1959 and 1960, it seems quite pertinent today. Notice that arms control is put at the top of the list. It became obvious to most observers in the late fifties that the new technology could not be viewed merely in terms of another set of weapons to be procured and used on the basis of narrow military considerations. Indeed, some of the best thinkers believed that without controls, implicit or

explicit, the world would become so unstable it would simply blow up. It is not surprising then that decision-makers become cautious. And the caution is rather startling. That doesn't mean they are cautious enough to stabilize the system satisfactorily. It may still blow up. But it's interesting to note how cautious they are. To take the first example, we do not have today an all-out arms race; we have what could be called an "arms walk." Military establishments are walking, not running, and while they're moving and competing with each other, in terms of what they could be doing, they are not competing very hard. In 1953, for example, we put 14 percent of our GNP into national defense. It is generally believed that the richer a nation becomes, the higher the percentage of its GNP can be allocated to military protection. Extrapolating the 1953 intensity of effort with 1961 GNP, we would be spending roughly between \$75 and \$100 billion a year. There is a \$25-\$50 billion gap between our current budget and the 1953 level of effort. The Soviets, too, seem to have reduced considerably the percentage of their GNP budgeted to arms. As a result of the recent Berlin crisis, both sides have increased their budgets, but they are still in percentage terms--under the mid-fifties precedents.

Let me give some other examples of moderation in the arms race. One might well have conjectured in the early fifties that by the early sixties South Africa might have a gaseous diffusion plant, would be refining uranium for use in reactors, and even selling bombs on the side to a selected clientele. The South Africans might be criticized for doing this, but they're probably fairly immune to criticism. One might also have expected, for instance, that once the French tested the bomb, the Swiss, Swedes, and Germans would soon follow. Or, when the Chinese prepare to test the bomb, one might look for the Indians and Japanese to follow suit. It is now believed that the Chinese are going to test the bomb in the next year or two, but the Indians and the Japanese are not moving--they're not interested, even though they could get bombs quite easily.

By and large, there is a growing revulsion against nuclear weapons. There is an even stronger revulsion against bacteriological and chemical warfare. You can get good people to advise on the latter, but you cannot get the kind of dedicated and ingenious work that you formerly got in the nuclear weapons field. Vannevar Bush makes a significant statement on this point in his book, Modern Arms and Free Men:

How about biological warfare? This was under development. . . There were those, before and during the war, who fully believed that it rivaled the atomic bomb and that, with an equivalent fraction of the national effort devoted to it, its potentialities were even greater as a means for bringing Germany or Japan to her knees.

Did the scientists rush into it? Did they insist it be given the attention its potential importance deserved? Did biological laboratories all over the country turn their efforts automatically in this direction? They did not. . . Devoted, patriotic, courageous individuals reluctantly turned their efforts in this direction in the laboratory and in offices because of a conviction that we could not safely remain in ignorance of the methods involved, and they did effective work. The medical men would have none of it. Neither the Office of Scientific Research and Development nor the War or Navy Department wanted it included in their organizational structures, and it was tucked off in a corner in the maze of Washington. The National Academy of Sciences advised on it, ably and wisely as is its practice, at the call of the Secretary of War. But all this, and a deep one . . . The human race shrinks and draws back when the subject is broached. It always has, and it probably always will. (11)

Vannevar Bush may or may not be right in his last remark, but most of the emphasis on bacteriological and chemical warfare in this country seems to be on incapacitating agents, not killing agents.

Almost central in guiding decisions and determining whether or not new weapons systems are adopted, such as the AICBM or civil defense, is the fear of the uncontrolled arms race, particularly the fear of touching off an offense-defense arms race. I suspect that it is a fair judgment that most of the motivations behind slowing down both the civil defense and the AICBM program have very little to do with the military cost and effectiveness (narrowly defined) but more with such questions as the arms race and the effect of such programs on the general international and domestic political situation.

The AEC is trying to do something constructive with nuclear explosives as a part of Project Plowshare. They might, in fact, bring water to the desert, bring coal and oil to the top of the ground, and so on. Yet many take a dim view of the project. To these doubters the advance in economic welfare does not seem worth the possible risk of increasing the arms race by making such weapons widely available. Nuclear explosives are not, of course, weapons; they're called devices, but they explode, and they explode rather impressively.

There are a few other interesting items listed in Table 5. We are now in the missile age, and furthermore, the bombers operate alert and dispersed (an almost incredible operation by the standards and beliefs prevalent in the mid-fifties). Having such alert forces increases the possibility of accidental wars. Having both sides permanently poised to strike also creates the possibility of a zero warning attack in a non-tense situation. It also creates the problem of reciprocal fear of surprise attack, discussed later.

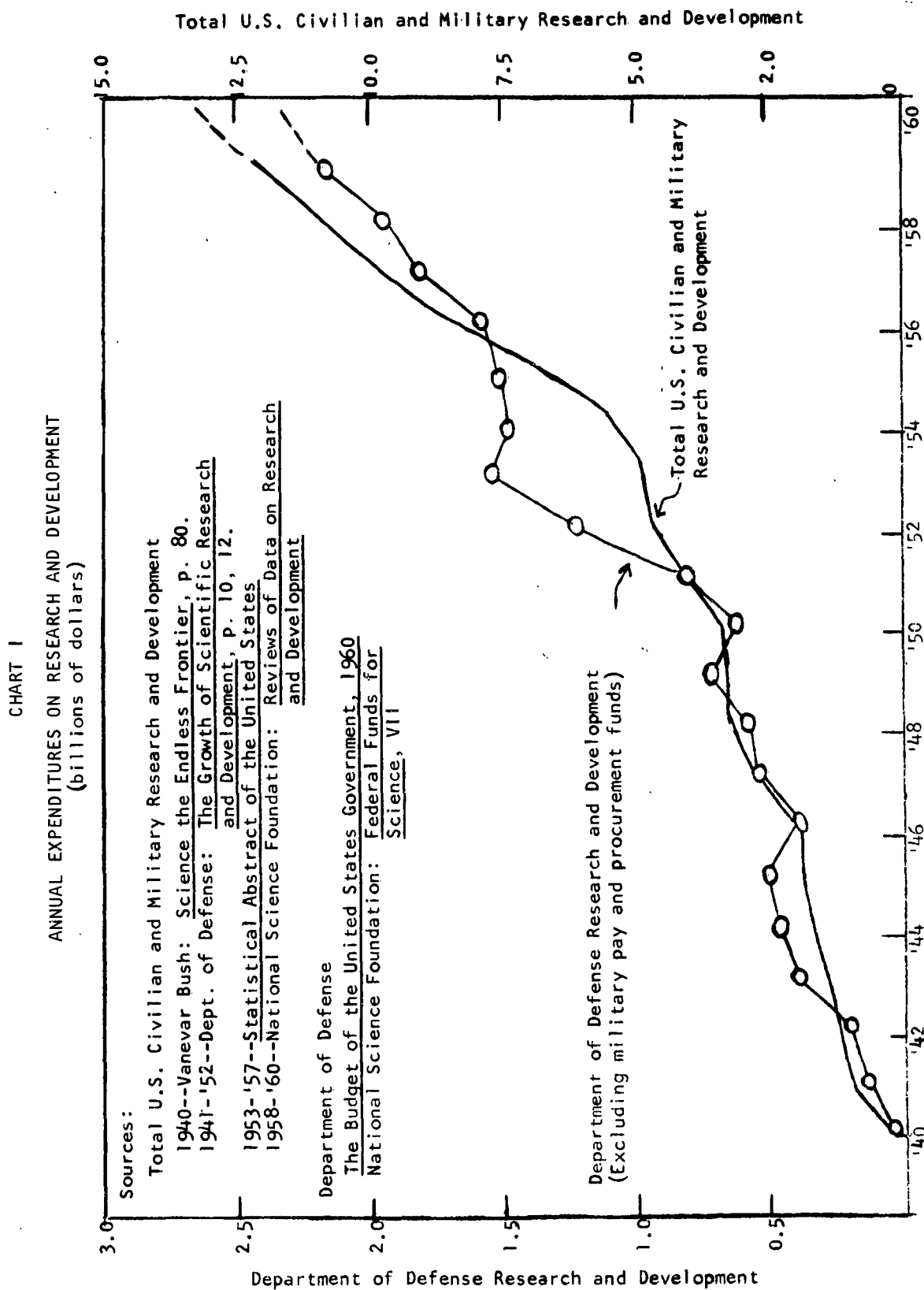
Nuclear weapons are now very inexpensive, efficient, versatile. The United States has finally begun to tackly some of its weaknesses in civil defense. Another significant item refers to Canadian cancellation of the CF-105 project, and British cancellation of their Blue-Streak missile, after the two countries had spent a major fraction of a billion dollars on these projects. As a result of these two events, there is a widespread belief that it is going to be very difficult for countries other than the United States or the Soviets to enter or stay in the arms race. I suspect that this is a reasonable supposition for the sixties, but not a sound one for the seventies. It is very important to understand that these cancellations may reflect a temporary and, therefore, misleading situation. In fact, it is possible that the transition to cheap "SACs" might occur in the late sixties. In any case, sometime in the next decade or two technology will exist which could make it easy for many countries to get into the weapons system business.

Probably the most important thing about 1961 is the widespread belief that deterrence either is or soon will be a two-way street with all the implications for the defense of Europe or negotiating in a tense crisis.

Three Future Technologies

We placed the first technological revolution in 1951, a short six years after World War II. The next one was placed in 1956, five years later. The next one was placed in 1961, another five years later.

We are now spending increasingly more money in research and development, (12) and, what's more important, we know how to do it better--we're more efficient at it--smarter, if you please. It is, therefore, likely that the revolutions will come faster. We will assume that the next three technological revolutions occur in 1965, 1969, and 1973 respectively. The assignment of developments to particular time-slots should not be taken literally but as examples of the kinds of changes that the sixties and early seventies could bring.



D. The 1965 Setting

TABLE 6

1965 TECHNOLOGY

- * Independent nuclear deterrents being phased in
- * Limits of bomb technology (with testing)
- * Minuteman B and Polaris C
- * Second generation Atlas and Titan
- * Samos
- * BMEWs-B, Midas-B, SAGE B, Bomarc B and C, Nike-Zeus A and B, Hawk B, F-108, B-58B, B-70, and Dynasoar all technologically possible but may be cancelled
- * Protected B-52G and H, B-47E, B-58A
- * Airborne ballistic missile
- * Protected command and control
- * Exotic fuels
- * Anti-radiation drugs
- * Inexpensive reliable research missile
- * Nuclear-powered airplane? Rocket?
- * Experimental climate control
- * Commercial nuclear explosives
- * Super guidance
- * Bacteriological and chemical warfare
- * Astronautics

Sometime in the mid-sixties, NATO (or even the Germans or the European Economic Community) may begin phasing in their own nuclear deterrents. The French, of course, already have a program. It is also possible, particularly if the Chinese test nuclear weapons, that the Japanese and the Indians will be getting their own nuclear weapons. Many of us would have guessed in early fifties that this would already happen by the late fifties (and it didn't), so we may be wrong again, but that's the guess.

One thing which could make a great deal of difference in the mid-sixties is the fact that we will have satellites such as the "spy in the sky," SAMOS, to maintain surveillance of the Soviet Union, China, and other areas. We do not know yet how high the quality of photographs produced by this satellite will be--presumably they won't be as good as those taken by the U-2, but perhaps they will be quite satisfactory. Even though the Soviet Union has a good deal of cloud cover, one could still expect that a good deal of the land mass will be open to surveillance and intelligence. Furthermore, these photographs can presumably be supplemented by more classical forms of intelligence activities.

Up to now we have concentrated on the technology of air warfare or strategic warfare. By the mid-sixties the balance of terror may be so firm that attention may be shifted to some extent to other kinds of warfare. This is less likely to be a limited war than a sub-limited war, where such things as terror, subversion, guerrilla warfare, coups d'état, faits accomplis, and the like are the important tactics. If this turns out to be true, it may be an example of another doctrinal lag. While the upper echelons of our government seem very interested in these possibilities, one finds that there has been little or no specialized equipment developed for such warfare. For example, today's American soldier does not yet have personal equipment for jungle warfare as adequate as that obtainable in World War II. (13)

The likelihood that there will be important developments in the efficiency of nuclear weapons is rather high. With 100% efficiency one could get 30 or 40 kilotons per pound out of a fission reaction. Whatever the practical limits actually turn out to be by the mid-sixties, we will be approaching them, at least for the medium- and large-size weapons.

The mid-sixties should also see greatly improved Polaris, Minutemen, Atlas, and Tital missiles. These will be hardened, dispersed, or mobile. As a result, it is quite possible that one important aspect of the strategic equation, namely, the destruction of many weapons of the defense by one offense weapons, will be changed. The decreased vulnerability of the weapons and their great ability to penetrate most defense systems may also introduce a change in the character of the arms race since these weapons may not become obsolete as fast as previous ones did. This is particularly likely if both the Soviet Union and the United States give up on defending themselves against missile attacks by means of some combination of AICBM, civil defense, and counterforce capability.

They may do this in order to seek a way out of the arms race and not merely because it is so difficult to defend against such attacks. In particular they may fear touching off an offense-defense arms race. While either nation could do a rather worthwhile job of defending itself against current systems, a good defense always encourages the other side to improve its offense, and even if our measures, on balance, are successful enough, in spite of the Soviet countermeasures, to justify our own costs (as I believe they would be--at least temporarily), the major effect of the offense-defense arms race could be a huge increase in both the mutual danger and the cost of maintaining arms. The Soviets might even be more deterred than we from starting such a race since they are likely to lose it.

It is important to realize that fear of losing an arms race is an important deterrent to starting or accelerating one. Exactly this fear may have been one of the major deterrents discouraging the Soviets from investing greatly increased resources in their strategic forces in the past. Faced already with shortages of such resources, they might well feel that if they did allocate more resources to strategic warfare, we would too, and that this would put them back where they started.

It is also quite possible that the arms race, as far as the strategic forces are concerned, will not be slowed down, that there will be a competition in offense and defense or in flexibility and that the rate of replacement of systems will be more rapid in the future than in the past. Even more probably, the arms race may cease to be a contest merely between two big protagonists-- U. S. - S. U.--and include Nth countries.

The next item lists a whole series of systems which would have been extremely impressive by the previous technological revolution's standards, but by 1965 are likely to be made obsolete by events, technology, or doctrine. We should probably emphasize that this list comes directly out of On Thermonuclear War and does not refer to any current controversy.

The point on the 1965 list concerning Protected Command and Control needs special attention here. By and large, the requirements of command and control, while very important, tended to be ignored or under-emphasized throughout the fifties. By the early sixties, their importance was widely understood, both in the sense of guaranteeing that the forces did what one wished them to do, and, possibly even more important, of seeing that the forces did not do what one did not wish them to do. A minimum requirement for command and control systems, of course, would be that they survive an attack.

This is just as important for the second as for the first reason. We do not want individual commanders cut off from the centralized command and control system, either by a peace time accident or a deliberate enemy attack. Such severance could make them feel the need for action before they were destroyed. Local commanders might thus institute unauthorized behavior, not because they feel disobedient or mutinous or wish to be irresponsible, but in desperation. In an attempt to guess what the orders not received may have directed, they may well discount the force of previous peace time injunctions to risk destruction rather than to act on their own. In part sometimes the injunctions go the other way. (14)

As Secretary McNamara has said:

With this protected command and control system, our forces can be used in several different ways. We may have to retaliate with a single massive attack. Or, we may be able to use our retaliatory forces to limit damage done to ourselves and our allies by knocking out the enemy's bases before he has had time to launch his second salvos. We may seek to terminate a war on favorable terms by using our forces as a bargaining weapon--by threatening further attack.

In any case, our large reserve of protected fire-power would give an enemy an incentive to avoid our cities and to stop a war. (Underlining ours.) Our new policy gives us the flexibility to choose among several operational plans, but does not require that we make any advance commitment with respect to doctrine or targets. We shall be committed only to a system that gives us the ability to use our forces in a controlled and deliberate way, so as best to pursue the interests of the United States, our Allies, and the rest of the Free World. (15)

By the mid-sixties we probably will take the problem of accidental war seriously (even though, in many ways, the fifties may have been more dangerous). Many skeptical eyebrows would have been raised by an assertion in the mid-fifties that in about 10 years few would worry about accidental war, although there would be two or three thousand U.S. missiles on the alert, and a similar number for the Soviets. Yet such systems will exist by 1965. We know a good deal more about them now, and partly because of the many safety precautions, it does seem much safer to have them than we once thought possible. Nevertheless, if some buttons do get pressed accidentally, resulting in a large-scale accidental war, it will be very difficult to survivors to make it seem plausible to any investigation committee or other survivors their current reasons for assuming that the situation was relatively safe. They will not be able to make convincing any statement to the effect that even a pessimist would not have expected an accident.

The real danger of accidental war seems to arise if there is a set of improbable coincidences during a period of tension. (16)

The possibility of coincidences worries people. They would like an understanding with every individual commander that even if he believes the enemy has destroyed his communications, or regardless of how many mushrooms he may think he sees, or no matter how many radio broadcasts claim that a war has begun, unless he has an official, verified, confirmed order, he just stays put and, if necessary, lets himself be destroyed. Of course, in a normal, peacetime situation most commanders would tend to assume a war alarm to be a mistake, and the major problem may be to get them to believe the alarm. (17)

The problem, of course, is different in a very tense situation. Then commander and staff get nervous and may, in fact, misunderstand orders. If we are able to avoid an accidental war, it will be mainly because of adequate command and control, and it's important to have it. We are at least in process of getting it, if we do not already have it by 1965.

E. The 1969 Setting

When I formulated the table below some two years ago, the late sixties were very hard to delineate because some projects under way were classified and others unpredictable. In this table, I'm really not predicting anything, but I will exaggerate a little what I think may happen. Since some of the more important developments are either classified or for some other reason are not listed, the exaggerations are not likely to distort the probabilities. There will be surprises--pleasant or unpleasant, as the case may be.

TABLE 7

1969 TECHNOLOGY

Extrapolations and Breakthroughs

- * Cheap, simple bombs
- * Cheap, simple missiles
- * Cheap satellites
- * Controlled thermonuclear reaction
- * Other sources of cheap neutrons
- * Other sources of nuclear fuels
- * Californium bullets
- * Ground effect machines
- * Reliable sensors
- * Super calculators
- * Cheap calories
- * Medical progress
- * Advanced materials
- * Cheap, fast transportation for limited war
- * Reliable command and control
- * Doomsday machines
- * Disguised warfare

When I use the words: cheap, simple bombs, cheap, simple missiles, cheap satellites, I am not suggesting that these inexpensive, simple bombs, missiles, and satellites will be widely available. Rather, I am saying that the two largest nations, the Soviet Union and the United States, will have designs in their safes, which any high-class ordinance manufacturer could quite easily translate into the equipment envisaged. How long it will take before these designs get distributed to the rest of the world depends upon a number of factors difficult to predict.

The controlled thermonuclear reaction is not expected to really work. My colleagues who have worked on that particular problem are dubious of any successes before the year 2000, if then. With this slim prospect, it is curious to see the Soviets, the British, and ourselves planning to spend more than \$2 billion on this project by 1970. We might succeed--it's a fair amount of money.

The californium bullet is a joke--the kind of joke analysts and planners invent to make a point. Californium is an artificial element. It will probably cost a couple of billion dollars an ounce, but when cheap neutrons, cheap nuclear fuels, or controlled

thermonuclear reaction become available, it should be much cheaper. It fissions much more efficiently than does uranium or thorium. There are $3\frac{1}{2}$ neutrons per fission, and this means that a very small amount of californium could be packaged in a bullet and made to fission with an explosive force of ten tons. You really could have, in theory at least, an atomic six-gun. You get a kind of inflation with these things. When this possibility was mentioned to a group of young army officers, one of them asked, "Did you say ten tons, or ten kilotons?" To one reply, "Ten tons," he said, "Oh! Everybody else has ten kilotons."

There has been an incredible development in calculators in the last ten years. But we do not yet know whether the super calculator will make a significant difference. Every two years or so sees a revolution in computer technology. This technology has made great changes, but, by and large, it has not affected greatly military tactics and strategy or even planning. Some people believe that by the early seventies we will have "gigacycle computers" which will be incredibly fast. Such futuristic computers could really make a startling difference--to research, analysis, planning, operations, tactics, and strategy. There are two jokes analysts tell which illustrate better than any description the difference such computers could make. A man goes up to a machine and he's going to ask a really important question--not one of these silly questions the government's always asking, and he says, "Is there a God?" And the machine hums for thirty seconds and says, "There is now!" Or another chap goes up to the machine and says, "If you're so smart, tell me where my father is." The machine says, "Your father is fishing off Cape Cod," and the chap says, "Well, that shows how much you know. My father, John Smith, Sr. is in San Francisco." And the machine says, "Yes, John Smith, Sr. is in San Francisco, but your father is fishing off Cape Cod."

There could also be doomsday machines in this period, but it is unlikely. It takes a number of years to build them, and they're very expensive. Besides they don't really seem to be reasonable.

There can be disguised warfare. A nation may not know that it is being attacked; that is, one nation can drop bugs over another nation's territory to give everybody a cold so that national efficiency drops and the nation is not as competitive in the cold war. Or tranquillizers can be circulated in the air we breathe. Then everybody would feel good, but efficiency would still drop.

Most technical people, correctly or incorrectly, who have looked at these possibilities do not believe that the present world order, or disorder, can last many more decades. They feel that one cannot devise and distribute the new equipment and expect anything short of a disaster. This is a very wide-spread point of view held by both conservatives and radicals who have done research in both the technological and social science fields. I hold that view myself; I used to hold it very strongly a few years ago; I hold it a little less strongly now. I used to make the remark that I doubted the system could last ten or twenty years; I now say, 'Well, it's hard to speculate; the existing system certainly looks dangerous, but it might surprise us yet by both lasting a long time and then peacefully giving birth to a stable world order.'

F. The 1973 Setting

TABLE 8

1973

?

The above chart was first drawn in early 1960. Now, two years later, we have very little to add. We are still in a situation in which the blind lead the blind, or perhaps better, the dim-sighted lead the dimmer-sighted.

Why are we interested in 1973? It's only eleven years from now, so we might be interested just out of curiosity. More immediately, we are today laying down the weapons systems for 1973. But the early seventies are precisely the start of the period where no one can claim he has any precise notions of what the political or technological environment will be like.

Nevertheless, many of the weapons systems with which we will face the largely unpredictable requirements of a decade hence are in the R&D stage today. Others are in the study or "selling phase." By accelerating some current projects or by speeding up some stages by better management systems and by forced marriages of on-the-shelf items, we may be able to telescope the lead time somewhat and thus squeeze in a few significant innovations coming into view in 1965 or soon after. (18) But really significant developments, whether of the planned sort or the fortuitous exploitation of as yet uninvented components, are likely to be 1970 systems at the earliest.

CHART 2

LEAD TIME

RESEARCH															
PROGRAM'G				10 C (2-5)				USEFUL LIFE (7)							
'SELLING				PRODUCTION (5)				PHASEOUT (4)							
PRELIM DEVELOPMENT (4)				PROTOTYPE											
STUDY (2)												INVENTORY (8)			
62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77
Years	62	63	64	65	66	67	68	69	70	71	72	73	74	75	

In Chart 2 above, are given the lead times for an accelerated program--an Atlas, Titan, Polaris, or Minuteman type program. Actually, the useful life of these systems is generally ten to twenty years, but, even if the useful life of the system is only seven years, our studies must consider the 1970's. We may come up with beneficial devices as well as non-beneficial devices. The Polaris and Minuteman missiles go a great distance toward reducing the probability of accidental war. I have often criticized stabilized deterrence as a cure-all in the sense that stabilized deterrence doesn't solve either the arms race or foreign policy problem. There should be some capacity to avoid provocations as well as nuclear strikes. But some degree of stable deterrence, that is, the deterrence of nuclear attacks, is preferable to an unstable or accident-prone nuclear situation.

We have not been too imaginative in the past in taking into account many contingencies or the large range of possibilities. On the whole, we have been relatively dull, prosaic and earth-bound. It is important that this be changed. We should consider a large enough range of contingencies and responses intensely enough to make the planners aware of them; we should see that the preparations are made, and that enough thought has been put into them so that, if the ideas or any form of them are used in practice, they will have been thought about sufficiently to be useful.

Conclusion

In this section I have scarcely been able to touch upon the complexities of the technological arms race and the stability of the United States-Soviet balance of terror. I have tried to point out that technological progress is so rapid that there are almost bound to be doctrinal lags. These doctrinal lags will in themselves be dangerous, leading to important gaps in our preparations, the waste of badly needed resources on obsolete concepts, the neglect of possible strengths, the excessive use of especially glamorous tools, and, possibly most important of all, heightened possibilities of serious miscalculations or accidents because we have not had time to understand and make provisions for the requirements of the newly installed systems. To the extent that arms control measures are supposed to alleviate dangers or costs by allowing the current "balance of power" status and military competition to be conducted, by agreement, at cheaper or safer levels, or to the extent that one hopes to increase each state's objective capability of preventing surprise attack or other disaster, this inability to understand "the military problems" introduces almost intolerable complications. (The reason for the adverb "almost" is that we have these complications, whether or not we have arms control.) And as yet I have practically ignored the even more complex problem of the conduct of international relations in a world in which force is becoming both increasingly more available and increasingly less usable, a problem that is complicated by the spectacular increase in the number of sovereign nations, by increased nationalism, militarism, and "ambitions" in these new nations and governments, and by the revolution of rising expectations.

II. Abstract Models and Scenarios

A. A Model with a First Strike Advantage

How do you try to come to grips with strategic planning in a world like this? Some say, forget about it. It's too hard to think about, so don't think about it. There's a marvelous story by Saki--one of a series of satires on the British government. Alice, from Alice in Wonderland, wandering through the governmental buildings, comes to the War Ministry. This occurs just after the Boer War, and the War Minister is explaining to Alice how complicated modern war is--the logistics, the transportation problems, the rapid fire of the guns, the new equipment, the training that's required. Alice is impressed, and she says, "Gee, if modern war is that complicated, how could you go to war?" The minister replies, "Oh, we went to war all right, but not in the modern fashion--we just used the same old ideas." And you can do that. You can design your equipment and build it without trying to understand it. That may be considered an irresponsible way to act. It may or may not be irresponsible to buy this kind of lethal equipment, but it is certainly irresponsible to buy the equipment without thinking about its use.

How do you think about a complex problem like this? There are two basic approaches: One is to rely on experience, history, and intuition. Or one can try to make the leap to the new situation--do a standing jump from the old ideas to the new. He can try to grasp and assimilate the new technologies into his past understandings. Usually the attempt does not go quite far enough. The other way to do it is to use simple models, artificial examples, which can be readily understood, and these tend to take you too far. One then has to back-track in order to touch reality. It is something like a pendulum. The attempt to extrapolate from experience doesn't go far enough; the attempt to use models goes too far. The proper approach is presumably something in between, but it's unlikely that anybody will find a golden or even a silver mean. Nevertheless one must make the attempt; so let's consider a couple of simple models and see what we can learn from them.

I wish to emphasize that these models are very over-simplified; furthermore they are models by assumption. They do not reflect reality. They are not offered as descriptions of the world as it is, or as it will necessarily be, though the world might be like these models under some circumstances. They aim to prod thinking, to stimulate and provoke, to stretch the imagination.

These hypothetical models are intended only as simple illustrations of areas that it would be fruitful to study in detail in a more realistic context. Through them one can define language,

formulate concepts, and discuss and emphasize some elementary principles more clearly than by taking complex examples from the real world. In particular, it is difficult to discuss what role nationality might play in deterrence and war unless one first has some idea of what is or is not rational conduct to enable contrast with the other possibilities. One may, of course, get into trouble if one then blindly applies the lessons learned from such models to more complicated and realistic problems. But it is better to take the risk that such models may be misused than to forego all attempts to develop a clear understanding of at least some parts of the problem.

TABLE 9

A SIMPLE MODEL

Fixed

Two countries P & Q
Each has 100 cities
Each city has 2,000,000 people
100% reliable missiles
One missile can destroy a city
Reliable and invulnerable C & C
Completely flexible war plans

Varied

Number of missiles
Vulnerability of missiles
Civil defense preparations

The two countries in our model will be called P and Q to keep the problem impersonal. We are trying to look at a military, technological situation without asking, for the moment, the effect on personalities. (Confidentially Q is Russia.)

Nobody lives in the country, which is cultivated and harvested entirely by machinery. The only things beside the machine shops in the wide-open spaces are the missile bases. Each country has missiles which are absolutely reliable--they always hit what they're fired at, always fire when the right button is pushed, and each one has a warhead sufficient to completely destroy the enemy city at which it is aimed.

It will also be assumed that the command and control systems for ordering the missiles to fire and for monitoring what happens are absolutely reliable and invulnerable, and that the war plans are completely flexible and can be adapted to any contingency

instantaneously. With all these assumptions, we have really assumed away many of the practical problems that a military force actually faces. We are doing this because we wish to focus attention on just three important variables: (1) the numbers of missiles, (2) the vulnerability of missiles, and (3) the civil defense preparation. We wish to point out some relationships among these three variables. By studying this simplified and somewhat misleading example, we can get a great deal of insight and information.

The table below illustrates the unprecedented situation of the fifties, when the usual rule that the offense needs an advantage in numbers before it can attack no longer held. The chart assumes that the missiles are so clustered that one missile on the offense destroys two on the defense. Let us now start by giving each country 1,000 missiles--a theoretical overkill by a factor of 10 since each country only has 100 cities. However, the situation is unstable. By firing 500 missiles, either side can completely destroy the other side's forces and still have 500 missiles left with which it can threaten or attack cities. Thus, even though each side has a first strike overkill capability against the other side's cities, neither will have an overkill in terms of the balance of terror or indeed any second strike (retaliatory) capability at all. This model illustrates what could be called unstable deterrence. On paper the side which goes first wins the war untouched.

TABLE 10
VULNERABLE MISSILES
(Note for Two Exchange Rate)

Balance of Terror	Number of P	Missiles Q	Comments
Unstable	1000	1000	
Multistable	1020	1020	20 are invulnerable
Controlled Counter- force Now Feasible	1020	1020	Add fallout protection
Includes a Danger- ous Option	1020	1020	Add evacuation for P
Option Now more Usable	1050	1020	Give P an additional 30 invulnerable missiles
Option Now Usable	1100	1020	Add 50 more invulner- able missiles for P

However, in the real world, there will always be military imponderables, as well as moral and political factors, to restrain a potential attacker. Therefore, even though both sides would greatly prefer a first strike to a second strike, both are still likely to prefer peace to war if there is a free choice between the two. Further, because the balance of terror is so unstable, both sides are likely to be wary (deterred) of provoking each other. However, in case a provocative act seems necessary, it is not unlikely that one would choose to precede it by a disarming strike since such a strike may seem less dangerous than provocation. Further, each side is likely to be anxious to get in the first blow if there is a crisis, which means that both are likely to be trigger-happy.

In fact, this situation is likely to make possible what Thomas Schelling has called the reciprocal fear of surprise attack.⁽¹⁹⁾ One side may feel that the other side may want to strike and that therefore it had better hurry and get its own strike off before it is destroyed. Further, this side will realize that the other side not only knows how it is thinking, it knows that the first side knows--and so on ad infinitum. Each side may then find itself under an almost incredible pressure to pre-empt.

Such instability due to a first-strike advantage and other philosophical consequences of the first-and second-strike concept is very simple. One could probably explain it to a child of ten.

It is amusing (or horrifying) to note that it took almost 15 years from the end of World War II for this concept to be reasonably well understood, even though it was implicit in warfare as soon as the atom bomb was invented. Not until the early fifties did some of the analytical and theoretical groups see the full consequences or the vulnerability of strategic forces; and not until the mid-fifties did the military establishments become clear about these effects. For example, until 1957 the Navy never did an exercise in which their carriers were struck first. Up to about this time briefings began with the statement that the Soviets had struck first. No one, however, had attempted to estimate the damage to our forces from the Soviet first strike, and indeed estimated our performance as if our planes were untouched. In fact, not until the late fifties does the general intellectual community begin to understand fully the problem, and it isn't until 1960 that the Executive Office and Congress clearly grasp these very elementary notions. One has only to read many of the 1958-59 discussions concerning the role that our IRBM might play in redressing the balance of Soviet superiority in rocket engine propulsion; (that is, they would have the range because of their greater propulsion but we had the advantage of better geography) to see that very few, if any, of the senior people understood how vulnerable our overseas IRBM would be. To give another example, the New York Times treatment of balance of power situations includes no references to the differences between the first and second strikes until 1959. Up to this point all they do is count numbers of planes and compare these numbers as if such comparisons were the only ones that were meaningful.

I do not believe that it will take this long in the future for such simple ideas as first and second strike to be widely understood and accepted and their consequences noted and acted on. But it is still startling to retrace the history of the understanding of the full importance of the difference between first strike and second strike.

Let us now change the model by giving each side 20 invulnerable missiles. Under these circumstances, we have a situation which may be called multistable deterrence. Even if one side launches 500 missiles at the other side and destroys a thousand of the defender's missiles, the defender still has 20 missiles left over with which he can destroy 20 of the attacker's cities. These cities will contain 40 million people. The thought of losing 40 million may deter him almost regardless of the provocation. The "almost" is quite important. There are limits to how far one side can go in provoking the other, particularly given the significant instability arising from the advantage of going first. The above situation is called multistable because it is relatively stable against accident (both sides will be careful); it is stable regarding surprise attack, and it is also almost stable vis-a-vis extreme provocation.

Multistable deterrence is a much better description of the real world in the fifties than the usual analogy of the Western gun duel where the man who fired first and accurately won. While this analogy has been pushed by many analysts, it overstates the case, and its use has led to an over-emphasis on the concept of stable deterrence.

The symmetric vulnerable-missiles notion, applied to the fifties, also limps as an analogy, since there were probably some significant asymmetries between the U.S. and the Soviet Union. We really did have a rather large and competent strategic air force which regularly exercised in peacetime. It seems that the Soviets, while they had a large strategic force, did not really operate it very well in peacetime; in particular, they did not have a refueling capability.

Let us now give each side enough fallout protection so that cities will not be bonus targets in a counterforce attack. At first sight, such protection may seem irrelevant to the deterrence calculation since fallout protection doesn't protect the missiles; it doesn't even protect a city at which the missile is aimed; it simply enables the missile systems and the city systems to be separated. That is, if a missile is shot at another missile, the fallout from the nuclear weapon will not necessarily kill people in the cities. Hence it would be possible to have a missile-missile war without killing many civilians.

For example, it is conceivable that P could launch 500 missiles at Q, destroy 1,000 of Q's missiles, and then have the capability to warn Q: "If you shoot your 20 missiles back at me and kill 40 million people, I still have 500 missiles with which I can retaliate and overkill you by a factor of five."

It should be noted that while P is in an advantageous bargaining position, Q still has some bargaining power. In addition, some of P's missiles might go astray and kill some of Q's people, which also

might motivate retaliation. But it is clearly more likely in these circumstances that such a war will be controlled and less destructive than one waged with no fallout protection. Therefore, fallout protection has reduced P's and Q's deterrence. They may still be willing to add this fallout protection; after all, war can occur, and P and Q will probably both prefer that the war be controlled and brought to a compromise, rather than to get into an almost totally destructive all-out situation.

By introducing the possibility of a relatively nondestructive, controlled counterforce war, we further improve the stability vis-a-vis provocation. Whichever side now goes first can hope to use the subsequent strategic imbalance and the threat of retaliation against the civilians in fallout shelters to coerce its opponent into signing its version of a peace treaty. If the plan does not succeed the country striking first risks losing 20 percent of its cities. However, it may have great confidence in the likelihood that both its attack and the subsequent coercion will succeed. The country striking first is, however, unlikely to be sufficiently certain that both the attack and the coercion will work to be willing to risk an attack except under grave provocation or extreme pressures.

Fallout protection also makes possible low-level counterforce operations. That is, either P or Q can fire one missile and take out two of the enemy's. Under these circumstances, one has not yet changed the balance of power, but one has clearly indicated that he is willing to escalate to larger operations. One also now has the possibility of a fairly lengthy counterforce war. In other words, one could imagine a war in which it would take either side a long time to find the other side's Polaris submarines or hidden missile sites, and in which only a few missiles would be fired at a time without hitting many or any people.

Next, one could add an evacuation capability to one side or the other. This would be a dangerous option to use. If P evacuated its cities, Q might well feel that P was preparing to strike him, and, even though Q might wish to avoid war, he would want the advantage of the first strike if war seemed inevitable. Therefore, he is likely to strike P even during the evacuation, reducing P to 20 missiles. At this point, he can threaten to destroy every one of P's empty cities as his bargaining threat, while P can threaten to destroy 20 of Q's populated cities. It is not clear who would have the bargaining advantage, but in any case, by attacking, Q has protected himself from all-out destruction.

If in addition to giving P an evacuation capability, we should allocate to him an additional 30 missiles to give him a total of 50 invulnerable missiles, then the evacuation option would become more usable, or probably just usable. This would hold more strongly, of

course, if P should have more invulnerable missiles--say 100. P would then have an overkill either first or second strike, so it would be completely irrational for Q to strike just because P is evacuating his cities. Even though P is evacuating his cities, Q may still prefer peace to war; P may not care to lose his empty cities. Therefore, there is a chance that Q would be able to bargain with P. If, however, Q struck because he feels that P might strike later, the pre-emption would do Q no good. He would be just as dead as if he had waited.

B. Deterrence with Invulnerable Missiles

Let us now consider the other extreme and assume that the missiles on both sides are totally invulnerable. (See Table II below.) There would now be no point in even attempting a counter-force operation since one would just be throwing one's missiles away. This assumption would hold if each side had Polaris submarines and no anti-submarine capabilities or very "hard," hidden or mobile missiles. Many observers believe that, in effect, this situation either exists now or soon will. This is not actually so. There are likely to be large first-strike advantages through the sixties and possibly even longer. Nevertheless such a situation could occur, and since we now have some elements of it, it is fruitful to examine this situation.

It is difficult to find an historical analogy to the situation in which each side can strike at the other side's people and cities but cannot strike at the other's weapons. This practically unprecedented military situation will undoubtedly give rise to some unprecedented political and strategic problems. Such a balance of terror should not be confused with the Western gun duel. It is more analogous to a situation in which each man has a shotgun trained on the other man's wife and children, but not on the man himself. The only approximate historical analogy would be the practice in ancient times of exchanging hostages, such as the children of two rival kings or emperors. Moreover, although in previous history military situations did occur in which it was possible--if it had gone far enough--for one side to destroy the other totally, it has never--or almost never--been possible for both sides simultaneously to destroy each other's people and property.

TABLE 11

DETERRENCE WITH INVULNERABLE MISSILES
(100 Cities of 2,000,000 Population)

Balance of Terror	Invulnerable A	Missiles B	Hostages
Workable	1 - 5	1 - 5	2 - 10,000,000
"Adequate"	15	15	30,000,000
"Reliable" (No Alternative to Peace)	30	30	60,000,000
Approaching Absolute (Mutual Homicide)	50-200	50-200	100 - 200,000,000
Near Absolute (Stark Mutual Homicide)	1000	1000	200,000,000 (overkilled)

Assume for the moment that these missiles can be bought and maintained for about a million dollars apiece. (This is the estimate which Secretary McNamara gives for Minuteman missiles - in large quantity, of course - but still a good approximate number.) With something like from one to five missiles, one has a reasonably workable deterrent. There are between two and ten million hostages. In terms of classical war, this is a great many hostages. It is unlikely that any country will start a war with that number. Thus, one could buy deterrence for approximately \$5 million a year.

One might want more than a workable deterrent; one might want something called "adequate." ("Adequate" is in quotes because no balance of terror system can be really adequate.) One might then buy 15 missiles to increase the number of the hostages to 30 million.

A reasonable case can be made for this kind of deterrent. The system will withstand most of the strains to which it will be put. The system is very cheap. At \$1 million per missile it costs \$15 million a year. Why spend \$50 billion a year on a defense system? This workable balance of terror has 30 million hostages. No modern country has lost 30 million people as a direct result of enemy action. The Soviet Union lost about 25 million people in World War II but more than half of them died of disease and starvation. It is hard to imagine a foreign policy issue over which the United States and the Soviet Union would risk 30 million people. Yet, living with a situation like this, both sides are likely to forget how dangerous it is. We might then want to go up a bit to 30 missiles and 60 million hostages. We call this "reliable" and again put in quotes because it may not work. It looks reliable from the engineering point of view. One would say that it is probably reliable--it should work; still there is some small possibility that it won't.

I have pointed out elsewhere that if the number of hostages were 60 million there would be no vital interest other than immediate survival for which a country would be justified in going to war.⁽²⁰⁾ In such a case, the phrase "no alternative to peace" would be endorsed by almost everybody, at least superficially. However, as we will explain later, this phrase in practice may really be translated to say "no alternative to all kinds of violence" with the ever-present possibility of all-out violence.

Let us now assume both sides have something between 50 and 200 missiles--in substance, a "mutual homicide pact." We have deliberately made it 50 to 200. If you're a mathematician, you may ask, why did we not stop at 100? There are only 100 cities, and one needs only 100 missiles, since each is absolutely reliable. If one side has 101, the extra one is wasted. There is nothing to shoot at--it's overkill. Two hundred would be an overkill by a factor of two. The only reason for having this range is that most people are not used to numbers; anything in the range between an overkill by a factor of two and an underkill by a factor of two, 50 to 200 missiles, would be considered an absolute (or approaching absolute) deterrent.

Some might want to have an overkill by a factor of 10. Each side would then have 1,000 missiles. Why? Well, they want to deter the irrational. Now what do we mean when we say that deterrence depends upon decision-makers being rational? We really imply that they are not wildly irrational. To paraphrase a remark by Justice Brandeis, "This requires about the same kind of rationality as not standing on the tracks in front of a speeding locomotive." When we ask if somebody is rational, we really raise three questions: Does he ask, "What are the consequences?" Does he have a rough idea of what they are? And does he care? If you have an overkill by a factor of 10, most people will ask about the consequences--they can't

avoid it. In this case there is no margin for error despite any inability to calculate. If someone questions this remark, I will protect myself and call this "near absolute deterrence." For example, if one puts a sheet of flame between a clinically insane, desperately hungry lunatic and a good meal, he can predict that 99% of the time the lunatic will not reach through the flame. The poor fellow may be crazy, but not that crazy. Similarly, the decision-maker and his subordinates can be crazy too, but just how crazy?

Consider Hitler. When he was obviously losing the war, he ordered poison gas warfare. His subordinate, Speer, sabotaged the order. Speer reasoned, "Sure, we have the poison gas, and we're losing the war, but the allies have more poison gas. We don't gain anything by using poison gas. We just kill all the Germans." When Hitler threatened to have him shot, Speer said, "You can shoot me, but I won't follow the orders." Hitler also ordered a scorched earth policy, but this, too, was countered. Speer distributed machine guns to the factory workers so that the soldiers could not burn the factories down. In other words, subordinates may step in.

By and large, if there is an overkill by a factor of 10, it's hard to see how the missile buttons could ever be pressed. In a few moments, however, we will suggest several ways. Admittedly these ways are difficult to imagine; one has to stretch his imagination greatly, and to conjure up unrealistic or bizarre-appearing situations. However, these situations may occur, so there is an outside chance that the buttons might get pressed; therefore, the deterrence is "near absolute" not absolute.

C. Bargaining in a Balance of Terror

Now I want to consider the questions just raised. Assume each side really has 1,000 invulnerable missiles--an overkill by a factor of 10. Is there any way to exploit these missiles as instruments of foreign policy? It's hard to see how; they seem to negate each other. Can either side get any advantages from the weapons? The answer is, by and large, no. At least superficially, for 99 per cent of the purposes, there's nothing more to be said than to note that there is a balance of terror. But that one per cent can be rather important. So let's prod our imaginations--be a little bizarre--and ask ourselves under what circumstances these missiles could be used to affect our foreign relations. Consider how one might hypothecate force in a balance of terror environment such as the one I have just described.

This use of the word "hypothecate" goes back to Clausewitz, who had the following view of military power. When disagreements arose between nations in the 18th and 19th centuries, the first step in settling the disputes was through negotiation by the diplomats.

These diplomats calculated such things as the relative military power, the relative resolve, the relative recklessness of each nation, and then set trial balances. Sometimes they could not agree on the calculations--one nation's diplomat would be biased and pushed too hard for things to come out his way. The result might then be war, and war would decide the issues. War was a settlement day--it checked the diplomats' calculations.

It is clearly more difficult to hypothecate force in the balance of terror environment with 1,000 missiles on each side and with mutual annihilation seemingly the only outcome, but Table 12 below indicates five ways in which it can be done. The first is to manipulate the threat of war.

TABLE 12
FIVE WAYS TO HYPOTHECATE FORCE
IN A BALANCE OF TERROR

1. Manipulation of the Threat of War
2. "Ban-the Bomb" Movements
3. Limited Nuclear Punishment
4. Limited General War
5. Escalation Ladder

At first sight this seems hard to do since there should be no fear of war. The missiles are invulnerable, so nobody is trigger-happy. Neither side is going to be accident-prone because, again, there is no hurry. You can take all the time you want to make a decision. Neither side will have anything sensible to shoot at--that's very important. If you could shoot at each other's missiles, even in an inefficient and self-defeating way, that might at least appear to be reasonable, but one cannot shoot at the other side's invulnerable missiles, and why shoot at the cities, since they cannot hurt one. This seems to be a very convincing case that war has been abolished. Both sides have a deterrent that is nearly absolute: it is almost impossible to envisage a circumstance in which a rational decision-maker is likely to push the buttons. But then some psychologist will come along and say, "But, it isn't like that; people do irrational things; mistakes do happen; the most incredible miscalculations can occur."

Even if most people convince themselves that war is unthinkable, the weapons still exist, and they might be used. There will remain what might be called a residual fear of war. The psychologist is

right. Accidents can happen; staffs can disobey orders, misunderstand, or miscalculate; decision-makers can be irrational.

Since during the stress of a crisis the possibility of an inadvertent war increases, it will be of some value to avoid crises. Because of the residual fear of war the weapons will have some value as a deterrent to provocation other than a direct attack. In addition, no one can guarantee that the weapons will not be used if some "vital" interest is challenged, and there will be ambiguity as to what interests, when threatened, might be considered--perhaps wrongly--vital enough to precipitate their use.

This ambiguity about what is vital and the potentiality for accidents compels caution and prudence even in the most limited crises, and therefore the balance of terror acts also as a deterrent to small provocations. One can never be certain when a difference of opinion will turn into a dispute, a dispute into a minor crisis, a minor crisis into a more serious crisis, and so on, ending in disaster. In fact, the threat of such escalation and its ultimate outcome, mutual homicide, may sometimes be used deliberately. It may be the only weapon left for the protection of interests less important than sheer survival, but important enough for one side or the other to be willing to risk survival. Since taking such a risk may be the only weapon one has, he may feel obligated to use it. In these circumstances, the side that prevails on some issue on the lower rungs of the "escalation ladder" may be the one with the most resolve, the one most willing by threats, recklessness, or even "insanity"--real or feigned--to increase the danger of war.

One side can make meaningless nuclear tests, exploding hundreds of megatons. It can do military exercises. It can deliberately procure weapons systems which maximize the other side's perception of the danger. If we tell the people in New York City that there is a missile somewhere in Siberia with New York painted on it, they may not get very nervous. But if we send that missile over in a space craft flashing a big neon sign, "New York--for you," they may get nervous. If they get blasé about this sign, we can make it bigger or bring the space craft lower. If this doesn't work, we can double the number of signs or even let the missile blow up accidentally in outer space and explain that it was an accident but that the defect has been fixed and that it most likely will not happen again. There are various ways to bring a Sword of Damocles situation home to the other side. This is one of the major ways in which one can use the threat of war.

A second way is to manipulate both the responsible and irresponsible peace and disarmament movements. It will be clear to many people, correctly or incorrectly, that this situation can't last. If both sides have an overkill by a factor of 10, sometime, maybe

next year, maybe in the next century, the weapons will be used. They have to get rid of the weapons. If they have to get rid of them eventually, why not now? And somebody has to begin. Why not our side?

The problem is not to disarm the other side--that won't work. Sane people create movements for disarming as much as possible. They don't necessarily succeed in getting their own missiles dismantled, but they do succeed in influencing other matters. This is happening, for example, in England. The ban-the-bomb movement has not yet influenced policy on U.S. forces stationed in England but it has influenced other policies more or less related to these forces. Politicians don't want these groups stirred up. So creating situations that trigger such groups into action is another tactic an opponent can use. Neither the implied threat nor manipulation of peace groups is likely to result in overwhelming issues being decided, though these moves may be preparatory.

Or one can indulge in a limited nuclear punishment. I am deliberately going to introduce here a most bizarre form of limited nuclear punishment. Actually, I think that this illustration is not inconceivable, not even wildly improbable. Besides, once I have made some kind of case (if I can) for the most bizarre situation, an a fortiori argument is available to support the possibility of less bizarre forms.

Let's imagine the following situation: P and Q are arguing with each other. Neither side is willing to back down. Q decides to put pressure on P. He sends an army over the border and burns down one of P's cities. (This is more or less like an action in the Israeli-Arab controversy.) What is P going to do? There is some chance that P will back down. Or he may organize his own border raid. But let's assume P doesn't have conventional forces for this kind of retaliation. Suppose he is not prepared to back down and insists on punishing Q. He has a thousand nuclear weapons. Some people may argue, "Now's the time to press the 1,000 buttons." But that won't sound right after about 10 seconds of thought. (And most of the time you can count on 10 seconds of thought.) P might shoot one missile and destroy a city on the other side. That will teach Q a lesson. What is Q going to do at this point? (Bear in mind that Q started it "legitimately," using only conventional forces.) There are many things that Q can do. He can launch a thousand missiles. That won't sound right. He can launch 100--that sounds almost as wrong--there are only 100 cities. He may launch two missiles. That sounds wrong. He may launch one. That sounds wrong. He may launch none. That sounds wrong.

Q may very well end up launching one missile. What is P going to do then? P says, "He destroyed two cities of mine. I destroyed one city of his with a nuclear weapon. Now it's my turn again. But this can get out of hand. Let's stop it here. We've made our point: Q shouldn't do it. He's made his point." While this sort of exchange may appear far-fetched, it is certainly not impossible.(21)

Next, we can imagine using limited general war. Here, too, we will describe a most bizarre form--again to make an a fortiori case for less bizarre forms and because this most bizarre form could occur. Let me describe what I mean. Let's assume that Q invades P. Now it is a war to the finish--he's going to conquer P, using conventional weapons or tactical atomic weapons. P is losing. P will then say to Q, "You have to quit this war or I will blow up your entire country." Q will say, "That's unreasonable, I don't believe it." P will say, "I mean it, and to show I mean it, I will explode 100 weapons at 200,000 feet over each of your cities." There will then be a spectacular fireworks display! Q will say, "The most impressive thing I've ever seen. If it's lights in the night, I can match you." And he explodes 100 weapons over P's cities. This doesn't seem very impressive. P at this point, desperate and dangerous, threatens, "I will blow up a city a day until you back down," and he may blow up one city to show he means what he says. What is Q going to do? He has the usual set of choices. He can reply, "You're a mad man; you're crazy; I'll blow up two of your cities to show you how crazy you are! Why don't you stop it?" Or he can say, "Well P really is crazy, I'd better quit." Or he can add, "But I'd better blow up a city just to teach him a lesson." Or he might say, "I, too, will blow up a city a day. Let's see who quits first."

All of these things are ridiculous, far-fetched, and bizarre, but they are conceivable, and not wholly impossible.

The notions of limited nuclear punishment, limited general war, or controlled reprisal are most likely to become more important over the next 10 years. Such ideas all refer to limited nuclear attacks upon countervalue targets, such as a cities or other valuable property, in reprisal for some serious provocation. They are somewhat restrained versions of the uncontrolled city-trading idea. The limited general war involves the use of general war equipment as part of a negotiating process. In such a war, the decision-maker asks himself: "(1) How did the war start? (2) What are the cease-fire terms we are trying to get? (3) What must we do to protect ourselves and to get the best cease-fire terms?" He does not ask: "How can we do the most damage to the enemy?"

When the President of the United States refers to controlled response, graduated response, or discriminating response, he is referring to limited general war. This type of action was not

considered feasible before the Korean War. If someone had suggested it then, the response would almost certainly have been, "You mean we would not automatically use bombs on the other side's cities?"

Such a war would be one in which one side or the other attempts to use force in a rational and discriminating way. We have already discussed this. The controlled war notion is the direct opposite of the spasm war, in which each side tries to use all its weapons as fast as it can in an orgiastic spasm of destruction.

The controlled war may require withholding tactics and an adequate command and control capability for use in deterrence, bargaining, and negotiation during the war. At first glance, this strikes many people as an academic absurdity. Yet, President Kennedy declared in his March 28, 1961, special message on the defense budget:

Our weapons systems must be usable in a manner permitting deliberation and discrimination as to timing, scope, and targets in response to civilian authority. Our defenses must be secure against prolonged re-attack as well as a surprise first attack.

It would seem, therefore, that we have either already adopted the concept of the controlled war or have at least taken a long step toward getting the necessary capabilities.(22)

By and large, Americans (and perhaps most people in the West) are too unwilling to consider the use of moderate levels of force in behalf of limited objectives, and, once committed, are too willing to use force in an extravagant and uncontrolled manner. Both attitudes are potentially excessively dangerous and should be guarded against. These biases could have most serious consequences unless we deliberately and consciously think about ways in which violence may occur and how to keep it relatively limited.

One can generalize on these possibilities by introducing the concept of an escalation ladder. The particular escalation ladder that I will outline is applicable to a somewhat wider range of situations than would be encompassed in the simple model employed in this section. So it will be useful to consider at this point a more realistic content. We will return to our discussion of simple models after we have finished with the escalation ladder and some of its consequences.

TABLE 13
AN ESCALATION LADDER
A GENERALIZED (OR ABSTRACT) SCENARIO

Aftermaths	
Central War Rungs	25. Some Other Kind of General War
	24. Limited Strategic Attacks on Population
	23. Counterforce-plus-Avoidance Attack
	22. A Partial Disarming Attack
	21. Formal Declaration of War
	20. Complete Evacuation (~95%)
	19. Limited Strategic Attacks Against Property
	18. Low-level Strategic Counterforce Attack
	17. Evacuation (~70%)
	16. Maneuvers Which Seriously Degrade Enemy's Defenses
Bizarre (or Transition) Rungs	15. "Justifiable Counterforce Attacks
	14. Limited (Tactical) Nuclear War
	13. Spectacular Show of Force
	12. Super-ready Status
	11. Limited Evacuation (~20%)
Traditional Rungs	10. Intense Crisis
	9. Conventional War
	8. Limited Military Confrontations
	7. Harassing Acts of Violence
	6. "Legal" Harassment
	5. Modest Mobilization
	4. Show of Force
	3. Political, Diplomatic, and Economic Gestures
	2. Transition to Real Crisis
	1. Ostensible Crisis
Subcrisis Disagreement	

We have somewhat arbitrarily chosen to study an escalation ladder with twenty-five rungs.⁽²³⁾ Each rung is labeled so that, roughly speaking, the higher one is on the ladder, the more intense the dispute, and the closer one is likely to feel to some kind of all-out war. To some extent two opponents who are climbing up an escalation ladder are engaged in a "competition in risk taking" (Thomas Schelling's phrase). There are, of course, other possible sequences of escalation than the one shown in Table 14. Moreover, even on the above ladder many of the rungs can be skipped. One might, for example, go directly from #3 (transition to real crisis) to #25 (some kind of "all-out" war). Nor is the order sacred; many people would interchange some rungs. There is also no implication that one must go inexorably up the ladder. One could go either up or down step by step or skip steps. In short, the ladder is intended to describe only a class of situations and is useful only for the situations which are appropriate. Specifically, the ladder is not a model or theory of international relations, but only serves to bring to our attention possibilities and alternatives that could occur, and present some plausible structural relations that could hold between these possibilities and alternatives. It is not predictive but only suggestive of the range of possibilities and alternatives. Studying the ladder should prod one's imagination, not confine it. Most important of all it indicates that there are many relatively continuous paths between a low-level crisis and an all-out war--a path that is not inexorable at any place and yet one that might be traversed.

International relations are not likely to climb to the upper rungs, such as Limited Strategic Attacks, "Complete" Evacuation or "All-Out" War, very often, if at all. But the fortunate fact that most international bargaining will tend to be conducted on the lower rungs of the ladder does preclude the possibility of reaching the higher rungs. This possibility will influence events and may play a decisive role in the bargaining on the lower rungs. For example, if "All-Out" War were absolutely impossible, then the ability of one side or the other to apply blackmail or to manipulate unilateral disarmament sentiment would also be weakened. However, it should also be realized that even if there was no possibility of escalation to the upper rungs, the lower range would still be unpleasant, dangerous, and costly and therefore to be avoided.

There are two analogies one can apply to the escalation ladder--the labor strike and the game of "chicken." Both are useful even if inaccurate.

The strike operates mostly on the lower and middle rungs. In a strike situation, labor and management threaten and then inflict harm on each other and under pressure of this continuing harm seek agreement. It's usually assumed that events will not go to the limit.

We don't expect the workers to starve to death or the business to go bankrupt. The strike itself may even be staved off at the bargaining table. In a strike each side is expected to hurt or threaten to hurt the other but not to kill or even permanently maim. Under pressure of continuing threats or hurt it is assumed that some compromise will be arrived at before permanent or extreme damage is incurred. Once in a while expectations are not fulfilled. The business does go bankrupt or the workers do starve to death or leave the industry. But this is rare. Usually the strike is settled. And then the question immediately comes up, "Why go through this expensive, dangerous, and uncomfortable route to settle disputes? Why have a strike? Why not settle it?"

Something else about strikes is worth noting. In the absence of adjudication, the side most afraid of a strike will tend to get the short end of the bargain. Non-violence rarely works in strike situations. Even when it seems to work for some years and disputes are settled without strikes, a strike situation or a serious strike threat arises eventually. The threat of strike or lockout is ever present as a last-resort pressure for compromise.

Our escalation ladder has one feature which a strike analogy does not match--the potentially unlimited character of the top rungs. In the strike the maximum punishment that the workers can inflict on the management is to deny him one day's production or business at a time. The maximum punishment that management can inflict on the workers is to deny them one day's wages at a time. There is, therefore, a natural limit to the rate of punishment--a spasm of anger will not force either side over the brink. An escalation ladder for international relations is quite different in that each side decides at what rate it wishes to inflict harm on the other side. This makes the escalation ladder incomparably less stable than the strike. A moment of anger or a surge of emotion or even a seemingly innocuous miscalculation or accident can change everything.

Another useful analogy is the game of "chicken." A basic implication of the ladder is the notion that the higher up one is on the ladder, the closer he is to some kind of general war. I would like to emphasize the words "some kind"--that's a very important phrase. Wars come in all sizes and shapes. The usual picture of only one kind of war is just wrong. That doesn't mean that any of these ways is pleasant.

The game of chicken greatly oversimplifies international contests. It is played by two drivers on a road with one white line down the middle. Both cars straddle the white line and run towards each other at top speed. The first driver to lose his nerve and swerve into his own lane is "chicken"--an object of contempt and scorn. He loses the game. The game is played among juvenile delinquents for prestige,

for girls, for leadership of a gang. To quote Bertrand Russell, "This game is played by juvenile delinquents in America, and by nations everywhere."⁽²⁴⁾ He's a little unfair to the nations. The escalation ladder is much more complicated than the degenerates' game. Still, the game is a useful analogy because it emphasizes some aspects of international relations which it is important to emphasize--for example, the symmetrical character of the situation. Some juvenile delinquents play the game of chicken quite skillfully. The skillful player gets into the car quite drunk, throwing whisky bottles out the window to make it clear to everybody how drunk he is. He wears very dark glasses so he can't see a thing. As soon as the car gets up to speed he takes the steering wheel and throws it out the window. If his opponent is watching, he has won. If he's not watching, there's a problem. And if two try this strategy, it gets kind of dangerous. One of the reasons that people don't like to use the game of chicken analogy is because the phrase emphasizes the fact that two sides can play it the same way. I have the feeling that some of my colleagues who object to my label want to play the game of chicken a little, but they don't like to concede that that is what they are doing. I think it's a good thing to call it that, and I also think that under current conditions we have to be willing to play the international version of this game.

It is, of course, clear from the above why it is that many people would like to conduct international relations much the way a juvenile delinquent plays the game of chicken: they seem to believe that if our decision-makers can only give the appearance of being drunk, blind, and out of control then they will "win" in their negotiations with the Soviets on crucial issues. I do not believe that this is a possible or responsible policy. It is possible that we are willing to run some risks and do not want to hem ourselves tactically by being completely sober, clear-visioned, and in full control of ourselves but we do obviously have to have a reasonable degree of sobriety, a reasonable degree of clear vision, and a reasonable degree of self-control. It is also clear that the Soviets are likely to pursue a similar policy.

Since the escalation ladder is descriptive of a bargaining and risk-taking situation, the crucial point of similarity is psychological--how to convey the impression to the other side that he has to give way. We have already discussed how in the game of chicken, one driver may give this impression by showing his opponent that he is drunk, blind, and out of control. A somewhat more acceptable tactic is to invent or point out some persuasive reason why the other side should make the concessions. Therefore it may be appropriate to make a few remarks on bargaining before discussing the ladder. In particular we will indicate why the West might be excessively "flexible" in many situations.

TABLE 14

BARGAINING TACTICS

1. It is in your interest
2. My last demand
3. One of us has to be reasonable
4. My partner won't let me
5. Only you can reform me
6. Put yourself in my place
7. Let's meet half way
8. I am too X to give in
9. Let's not complicate the issue
10. Let's not oversimplify the issue

Table 14 lists in familiar phrases ten standard bargaining tactics used in both international negotiations and in person-to-person relations. The reader should be able to recognize that he has used them himself in crisis situations between partner and partner, husband and wife, father and son, friend and friend, and so on. It is still worthwhile to explicitly categorize and describe them.

1. "It is in your interest." The thrust of this argument is obvious. In order for a bargain to be made it must be, or at least seem to be, in the mutual interest of the parties. The threat of thermonuclear war is ever present. If the choice is phrased as being between thermonuclear war or some "reasonable" compromise, the compromise is always to be chosen, almost irrespective of how unreasonable it may actually be. At the extreme, when used against us, this reduces itself to "Red or dead" (but never, "red, white and blue or dead"). The other side can try to make the "compromise more palatable by pointing out that we do not really care as much as we thought, that our position is untenable since we lost the argument a long time ago and so should be realistic and recognize hard facts, that the controversy does not really exist but has been trumped up by a sinister minority for purposes of its own, that the objectives for which we are risking war are unworthy or at least not worth much--or any of 101 similar arguments with which to sow discord or weaken resolve.

2. "My last demand." Although the simple direct version of this technique cannot be used today because Hitler made the phrase so disreputable, the idea can still be gotten across by using slightly more subtle language. One might say: "If only you settle on this particular issue, it will not be necessary to fight over any others. Peace and prosperity will ensue if, and only if, you are reasonable on the particular problem we are discussing today."

Khrushchev uses, in some sense, the same technique, but since he can't say "This is my last demand," he describes Berlin as the "bone in his throat." This technique is useful because it may work. Appeasement and accommodation are not necessarily wrong. One must always ask the question, "Is it really his last demand? Or will it provoke him to greater demands?"

3. "One of us has to be reasonable." The side using this tactic tries to act like an unreasoning force of nature or, at least, a rigid human being. It tried to point out, implicitly or explicitly, that, "One does not argue with a hurricane; one seeks shelter in a cellar or suffers the consequence. Why then do you argue with me?" This tactic is particularly effective upon bystanders. It tends to channel attention and efforts to the side which is most likely to be reasonable. Neutrals may feel that if one side is not listening, then the other must. There is no point in addressing the unreasonable side. So: "After all, you are responsible, the other is not; so you have to make the concessions."

4. "My partner won't let me." One of the classic and most effective negotiating techniques is: "I would love to be reasonable but my partner (the Chinese, or Suslov, or the Stalinists, or the Republicans, or the newspapers, or the electorate) won't let me. Therefore, since I cannot give in, you must." This has all the advantages of the previous approach without raising the hostility of the other side and inducing him to act emotionally or irrationally. It is also a very respectable argument with just the right degree of sophistication to appeal to the "knowledgeable." A much-used variation of this argument requires making it clear that one's power position is too precarious to accept a diplomatic defeat, that a revolution, or at least replacement, is certain to be the consequence of any "humiliating" concessions. The argument works particularly well if one has deliberately staked his prestige on the issue, so that any concessions are then automatically humiliating. The force of the argument can be intensified by pointing out that the person or persons who will next come to power are so much nastier that it is to the advantage of one's opponent to be reasonable. One is in fact doing a favor to one's opponent by allowing him to prevent the leadership from passing on to less responsible or more intransigent hands.

5. "Only you can reform me." This is a technique that works particularly well with new people. Chamberlain had the feeling that even though other diplomats could not deal with Hitler, he could. Hitler had never lied to him. Any new person has the idea that he can settle the problem. The implications of such a method are that tolerance, patience, and perhaps concession if granted now, will ultimately lead to fewer demands or a position of mutual benefit.

6. "Put yourself in my place." It is probably accurate to say that every negotiation involves two parties with asymmetric advantages. Each side may have "unfair advantage" on its side, and it may be fair to say that often the purposes of the negotiation will be to work out a method whereby each side gives up some of its unfair (or destabilizing) advantages without favoring one or the other side. Thus, by concentrating on the unfairness of the other side's advantage, while emphasizing the fairness, inevitability, or inviolable character of your own, the terms of the trade can be altered in one's favor. For instance, in a demand for unilateral reasonableness, the Soviets say: "Put yourself in our place. How would you feel if we had bases in Mexico or Cuba or Canada?" But when we bring up such questions as, "Let's eliminate the secrecy that makes surprise attack possible and that stimulates arms races through fear," the Soviets say: "Well, our system gives us a special ability to have secrecy; why should we give something up just because you don't have it?" In other words, where the capability is simply part of the status quo and favors me, it would be unfair to ask me to give it up. Where the status quo gives you such special capabilities, you are not entitled to them.

7. "Let's meet half way." This is, of course, the classic bargaining technique of the West. Although it might be alleged that the West has not always been sufficiently understanding of the difficulties the Soviets have in accepting many superficially reasonable proposals, we have, more often than not, used tactics designed to achieve a mutually satisfactory resolution of the topic under negotiation. Unlike their Western counterparts, however, Communist negotiators almost never appear to discern merit in the other side's proposals. Even when they agree to a Western proposal, they tend to assert that they are not making any concession, but that their new position has been their policy from the beginning. There seem to be two basic reasons for this. First, Marxist dialectic makes it immoral for a Communist to negotiate with capitalistic nations in good faith. Negotiations are only acceptable as one of the many means of speeding the revolution. Second, Marxist ideology imposes on all negotiations the burdens of consistency at least on the verbal level, while the West, being more pragmatic, finds itself exasperated by these rituals. Moreover, this necessity for verbal consistency is reinforced by the Marxist view that one makes concessions only out of weakness. Soviet negotiators, therefore cannot say they will go half way, apparently on the theory that they would thus appear to be weak and invite pressure for more concessions.

8. "I am too X to give in." The X of this bargaining method could be weakness, anger, rigidity, obdurateness, stupidity and the implication as always is "Why do you waste your time talking to me. I am not listening." That is, one can pretend to be too stupid or stubborn to understand or accept the arguments and, therefore, as

good as they are, they will have no effect. Since "arguments will not work," the other side must decide whether to stand firm and risk war, or to yield. It is fruitless to point out the risks of standing firm to the stupid side; they simply won't understand the point.

Sometimes this tactic can be used as a super-sophisticated way of saying, "I understand full well what is going on but I also understand I can get my way by acting stupid. You, too, understand this. Since we both know I am going to win, why should I bother giving in? Why don't you get the best deal you can now, rather than wait until your position deteriorates under pressure from your allies and supporters?" Or finally one can simply say, "I am too (smart, strong, flexible, disillusioned, etc.) to let you take advantage of me. Why don't you give up?"

9 and 10. "Let's not complicate (or oversimplify) the issue." It is also very useful to phrase the issue or choose an agenda in such a way as to strengthen one's position. It is probable, for example, that there is no way of negotiating a solution to the Berlin problem as a local problem which will really settle the issue without, in effect, giving in to most or all of the Soviet demands. Similarly, there is probably no way of settling the German problem without the Soviets, in effect, giving in to us. Almost any type of election or any modest degree of choice would probably result in the end of the East German regime. If, then, the issue is framed as a local Berlin problem, we lose. If it is a problem concerning German unity, under most circumstances we will probably come out ahead, at least so long as German desires are considered by the solution. Both we and the Soviets understand completely that variations in the phrasing or even the order of discussion of topics can be of great importance in the eventual outcome of negotiations. Therefore, many Soviet-American negotiations begin with long drawnout arguments on the agenda. Such procedural arguments can be important, but many in the West become exasperated or even furious at our side for not conceding graciously on these "niggling or technical" details.

I have already made the point that many of the above arguments can be persuasive precisely because they may be used sincerely. However a study of transcripts of the various negotiating sessions with the Soviets shows that although they in some way understand and have used each of the discussed tactics, they have usually relied on far cruder methods. These tactics, while they may sometimes appear more effective in terms of newspaper headlines, can be seen to be considerably less effective than the more reasoned approaches. The Soviets apparently realize this and in recent years there has been an increasing tendency to use the bargaining methods discussed here. (25)

It is difficult to say whether the increased empathy on the part of the Russians that might accompany such new tactics would compensate us for their greater effectiveness. In other words, this change of approach is one of the most hopeful things in Soviet bargaining and one of the most menacing at the same time. It is hopeful because it establishes a dialogue--two people are talking to each other with empathy and sympathy. What is frightening is that this is also the same technique used to manipulate the other side.

CHART 3

SOME AWKWARD CHOICES

Policy	Probability of Loss	Amount of Loss	Expected Loss	Probability of No Loss
A	1.0	\$3,000	\$3,000	0.
B	.1	\$300,000	\$30,000	.9
C	.01	\$30,000,000	\$300,000	.99
D	.001	\$3,000,000,000	\$3,000,000	.999

A further point related to bargaining and the escalation ladder is illustrated by Chart 3. It shows why nations may be much too reckless, perhaps too willing to play the lower rungs of the escalation ladder in their game of chicken. If you ask a decision-maker to choose between policies A, B, C, and D, he will prefer A to B and B to C and C to D--that is, if he's a reasonable decision-maker. His judgment may change, however, if the losses are lives instead of dollars, particularly if the loss of lives is clearly traceable to an act of the decision-maker. That is, under policy A, 3,000 people definitely get killed. And it is known to be his fault. Under policy B, there is one chance in 10 of 300,000 people getting killed--and nine chances out of 10 that nobody gets killed. And in policy D, 999 chances out of 1,000 that nobody gets killed. The preferences may now be reversed. That is, policy D looks pretty good--most of the time it works. C looks better than B, and so on down the line. Actually D, C, and B are still the more reckless policies, and it's important to understand this even though in the short run, so to speak, these choices may look more acceptable. Further, it is well within the American tradition to threaten something grand rather than something cautiously small. This has a tendency not only to be more reckless but also possibly to be less effective. The point is that under these unpleasant circumstances most decision-makers tend not to play expectations. They react as if a very small probability that something may happen is practically equivalent to a certainty that it won't happen.

D. An Escalation Ladder

Unfortunately for the peace and stability of the world, international bargaining is not always conducted by purely verbal means. Each side may take certain positive steps either to bring the other to the bargaining table or to apply pressure during the negotiations. Sometimes these pressures tend to decrease with time or with a temporary solution of the problem at hand. At other times there is a tendency for each side to counter the other pressure with a somewhat stronger one of its own. We have called this step-by-step increase in pressure "escalation."⁽²⁶⁾ I would now like to return to the escalation ladder, repeated here, and discuss each rung in turn.

TABLE 15
AN ESCALATION LADDER
A GENERALIZED (OR ABSTRACT) SCENARIO

Aftermaths	
Central War Rungs	25. Some Other Kind of General War
	24. Limited Strategic Attacks on Population
	23. Counterforce-plus-Avoidance Attack
	22. A Partial Disarming Attack
	21. Formal Declaration of War
	20. Complete Evacuation (~95%)
	19. Limited Strategic Attacks Against Property
	18. Low-level Strategic Counterforce Attack
Bizarre (or Transition) Rungs	17. Evacuation (~70%)
	16. Maneuvers Which Seriously Degrade Enemy's Defenses
	15. "Justifiable" Counterforce Attacks
	14. Limited (Tactical) Nuclear War
	13. Spectacular Show of Force
	12. Super-ready Status
Traditional Rungs	11. Limited Evacuation (~20%)
	10. Intense Crisis
	9. Conventional War
	8. Limited Military Confrontations
	7. Harassing Acts of Violence
	6. "Legal" Harassment
	5. Modest Mobilization
	4. Show of Force
	3. Political, Diplomatic, and Economic Gestures
	2. Transition to Real Crisis
	1. Ostensible Crisis
Subcrisis Disagreement	

It is useful to consider a hypothetical escalation that goes through each rung in turn, though I remind the reader that there is nothing sacred about either the order or number of rungs, and that between rungs, great efforts will be made to settle or compromise the issue or to leave it unresolved but less threatening, i.e., there will be attempts--which may be partially or completely successful--to de-escalate. In a significant sense the scenarios summarized in the following discussion provide the background and environment for much of our negotiation and jockeying vis-a-vis the Soviets.

Subcrisis Disagreement

Even before they get on the ladder there may be a disagreement between two antagonists. At this point they may still be polite to each other. There is, of course, no reason why a dispute should lead to bad relations: the antagonists can either have the dispute resolved by some mutually satisfactory technique, or can leave it unresolved, hoping that time will bring some sort of a decision. However, if the disagreement takes place against the background tension that exists between the American and Soviet populations and government, then it is quite likely to escalate. There are many people in both countries who believe that there is essentially nothing wrong with the world in the present situation except that the other side exists and has goals which interfere with "peace" and with all legitimate acts or aspirations. There is almost a consensus on both sides that so long as the other side does not make major internal changes, regardless of what its leaders do or say there is at least a subcrisis disagreement or even an ostensible crisis (discussed next). In such an environment, any kind of new disagreement can rapidly escalate on the ladder.

1. Ostensible Crisis. In the ostensible crisis stage, one or both sides pretend that unless the dispute is resolved in the immediate future, more rungs of the escalation ladder will be climbed. Vague or explicit threats may be made that one will go to extreme measures rather than back down. These threats are made credible by various hints as to how important the government considers the issues. There may be officially-inspired newspaper stories that the chief of state takes a serious view of the matter. There may be explicit announcements or speeches by other important officials--but none of them of the bridge-burning variety, none deliberately designed to make it difficult for these same officials to back down later.

Extremist groups may be urging firm decisive action, and there may even be newspaper headlines, but most people are not worried. The "crisis" looks more like a play to them than a serious endeavor to put real pressure on the opposition. Neutrals will become concerned, however. There may be extreme pressures on one or both sides to meet, to moderate their demands, or at least to have them mediated.

One could conjecture, for example, that since Khrushchev's speech in 1958, the Berlin crisis has vacillated back and forth from an ostensible crisis to a real one, and that currently with the building of the Berlin wall and the subsequent lack of serious reaction, the Berlin situation has declined again to the state of ostensible crisis, though it may not remain there.

2. Transition to Real Crisis. The real crisis is characterized by the fact that all kinds of bridge-burning acts are undertaken. There may even be a deliberate increase in the stakes, a joining together of other issues--again with the deliberate purpose of making it harder for the other side to calculate that it can make one back down. Often concomitant to a crisis are angry outbursts in the press against the other side, bellicose speeches by prominent men up to and including the chief of state, and speculation on possible military measures to make the other side desist from its aims.

3. Political, Diplomatic, and Economic Gestures. If the other side does not look as though it is going to be reasonable, one can do more than make speeches; one can make all kinds of political, diplomatic, and economic gestures. One can, for example: (1) recall an ambassador for lengthy consultation; (2) refuse to facilitate negotiations on other issues; (3) make overtures to the other side's enemies; (4) denounce a treaty; (5) take some kind of legal or economic reprisal; (6) push resolutions in the U.N. against the other side; (7) replace an official in a key spot by one who is known to be "hard" or "tough"; (8) start a violent publicity campaign, indulging in mass meetings, spontaneous public demonstrations, and so on. The public may become involved; in this case the tone of castigating the "enemy" will tend to be shriller than before, or most of the accompanying communications can be made privately. The private threat creates less pressure because the side making it has shown itself unwilling to commit itself publicly. On the other hand, if the other side accedes to the threat or some face-saving compromise, then it hasn't lost as much prestige as it would otherwise have lost. Some economic gestures are complex in that they are ordinarily undertaken not just as protection or reprisal against the "enemy," but also for the benefit of those who undertake them. For example, though the Common Market is a perfectly logical development in the post-World War II world, it was undoubtedly precipitated and cemented by the chronic crisis between East and West. Economic gestures may even include the imposition of sanctions. Sanctions are designed entirely for the purpose of making the enemy desist from his aim by inflicting economic hardships on him. These may not only hurt him economically, but may also hurt him politically, in that they can lead to popular dissatisfaction with the government.

Similarly political and military gestures can be touched off by an escalation ladder and yet still be justifiable independently of the process of escalation. The creation of the NATO alliance, an

alliance clearly designed to fight a defensive (or possibly a preventive) battle against the Soviets if need be, was a military (as well as a political and diplomatic) gesture par excellence to the Berlin blockade and the Communist coup in Czechoslovakia and yet could also be justified in its own time as a reaction to post-war technology and the existence of two super-powers.

4. Show of Force. As the crisis intensified, one may hint or even make clear that violence is not unthinkable. Airplanes or ships may be moved around, reserves mobilized, provocative exercises carried out. By indicating that one has the means with which to indulge in violence and is making preparations to do so, an attempt is made to frighten the enemy while simultaneously mobilizing one's moral and physical resources. There are various ways of showing force: direct and indirect, silent and noisy. A direct show of force might consist of massing troops in a certain area, placing naval units in a certain sea, evicting diplomatic representatives, etc. An indirect show of force might be an increase in the draft call, the test firing of missiles, the conduct of maneuvers. All these shows of force may or may not be silent; they may be accompanied by a press campaign and official speeches in which it is specifically stressed that the "enemy's" behavior has "forced us to do what we are doing."

As part of a show of force practice evacuations for either cadre or population can be ordered, or just a limited evacuation for particular cities tested. Each side can accompany its demonstrations with public statements about the strategic balance of terror. These can be designed to influence either one's own side, one's allies, neutrals, or the opposition. Khrushchev, for example, often points out the totally disastrous effects of all-out war and the impossibility of limited war. Lately he has even emphasized the notion of mutual annihilation, even though this emphasis is in some sense bad for internal political propaganda. We on our side point out the enormous superiority we have in weapons. We might amplify these remarks by relatively detailed calculations on how the U.S. might conduct a counterforce campaign.

5. Modest Mobilization. The accompaniment of a show of force by a modest mobilization not only increases one's strength, but indicates that one is willing, if necessary, to call on more force or even to accelerate the arms race. This phase of the escalation would begin with the traditional cancellation of leaves and discharges by military personnel. This is likely to be preceded or at least accompanied by a governmental explanation as to why such measures are needed. It will be shown that one's own security is threatened by the enemy to such a point that only a show of fighting strength can deter him from pursuing his immediate objective. Generally speaking, the present and the past mood of the "public" in both the Soviet Union and the United States is such that any such

measures, if ordered, would not need long-winded explanations or preconditioning of the population. It is likely to be taken for granted that such steps are needed. In addition to calling up military manpower reserves, some possible moves are: failure to phase out obsolete equipment; cancellation of previously announced cuts in arm; announcement of modest increases in the budget; and increasing conscription.

The next step might be to take modest but serious measures of preparation by cadres and transportation agencies to move people, plus other preparations in rural areas to feed, protect, and otherwise to receive potential evacuees from cities. These last measures can be made to look threatening or they can be made to appear as a routine safety measure taken without much thought about its use as a pressure tactic. It is hard to decide in advance which image would be more frightening to the opponent. All such measures could be accompanied by varying kinds of publicity, official statements, and speeches, according to how bellicose or reasonable one wishes to appear. As always, private communications--either direct or through intermediaries--can also play an important role. There can also be deliberate leaks.

6. Legal Harassment. In addition to perpetrating acts whose major purpose is to show commital or anger, one can actually attack the other's prestige, property, or nationals "legally." For example, one can embargo the shipment of goods to a certain country, or one could even actuate a blockade. This could be done outrightly or under the guise of something else. For example, the Soviets can deny access by rail transportation to West Berlin under the guise that the railroads are out of order. One could also interfere with shipping, claiming that public health or safety measures required it. One could put vessels in port and force them to stay there by enforcing arbitrary health regulations. One might confiscate bank deposits or property of the other government or its nationals. One can even arrest or expel some of the other side's nationals who are within one's own borders on trumped-up charges. If done on any scale at all, such acts would be described as legal harassment rather than as economic gestures since they are very hostile, and will be construed as such.

7. Acts of Violence. If the crisis is still not resolved, acts of violence or other incidents designed to harass, confuse, exhaust, violate, discredit, frighten and otherwise harm, weaken, or demoralize the opponent may be manufactured. Bombs may be dropped by unauthorized or anonymous planes; "enemy" nationals within one's border can be arrested and charged with real or fancied crimes; embassies may be stoned or raided; soldiers guarding the border may be shot. Kidnapping or assassination of important personalities, or the

limited use of para-military actions such as guerilla warfare, sabotage, terror, ambushes, and border raids are other terrorizing tactics. Offshore reconnaissance or other intelligence activities may be increased. There may even be overflights.

8. Limited Military Confrontations. The tension can build up further, and there can be limited military confrontations, either local or global (for example, as at the Brandenburg Gate). Such limited confrontations are direct tests of nerve, committal, recklessness. They are also very dramatic so that all the participants and observers will take note of what has happened. Because it is so obvious that they can blow up and that they have traditionally caused war, many people think of them as being closer to the edge of war than in fact they really are. Under modern conditions of a relatively firm balance of terror, it is hard to believe that a war will erupt directly from a frontier incident, though the possibility is not so remote as to be completely disregarded. The main purpose of such confrontations, in addition to showing the resolve mentioned above, is to indicate clearly that reasonably large acts of violence are possible, that the unthinkable all-out war is becoming thinkable--even possible.

Under modern conditions of the permanent alert there is an almost continual global confrontation; therefore, a case may be made that this is hardly above point 1, i.e., subcrisis disagreement. American bases overseas, and American targets on the American mainland, are at all times zeroed in by Soviet missiles, and vice versa, but this activity can be increased and made more visible. Moreover the military confrontation can be conspicuously accompanied by various forms of political warfare. In particular, under modern conditions either side could point out, vividly and drastically, to the other side's population or to its allies the totally destructive character of thermonuclear war. That nobody will survive and that there is no alternative to peace can now be stressed with the clear implication that unless the madmen on the other side come to their senses, all will be over; alternatively, one can assure one's own side by pointing out that the other side is not mad; therefore it will back down.

9. Conventional War. The stage has now been set for some kind of organized military violence. It may simply be large-scale border raids such as occurred between the Japanese and the Soviets in 1939 (involving thousands of soldiers), a Trieste type occupation of disputed territory, a large-scale "police action" as in Korea, or finally even a formally declared war, but one restricted to the use of conventional equipment. If such a war is fought with any intensity, then we have the bizarre sight of two sides killing each other's soldiers with great effort, but not using their "quality" weapons--such as nuclear, bacteriological, or chemical.

Most Western strategists currently favor waging limited wars with conventional weapons, believing both that the use of nuclear weapons is not necessarily to our advantage, and that it is likely to result in escalation into all-out war, or, almost as bad, to set precedents which would make escalation into all-out war from a later limited war more likely. Moreover, even the limited use of nuclear weapons is likely to create pressures either for uncontrolled disarmament or for the acquisition of nuclear weapons by many nations. When tactical nuclear weapons are contemplated in strategic analyses such as scenarios and war games, they are likely to be used less to destroy the other side's military forces or to handicap his operations than to show resolve and committal. One side drops a nuclear bomb or two in order to show the other side that unless it backs down or accepts a reasonable compromise, more bombs are likely to follow. As applied to the U.S.S.R. and the U.S., this would be an unprecedented situation, and the consequences on the political fronts at home and abroad are entirely unpredictable. Much, or everything perhaps, would depend on who struck first. One important effect of the conventional war could be a large-scale mobilization, major increase in the military budget, and all kinds of crash programs--particularly in the area of civil defense and ground troops.

10. Intense Crisis. Whether or not there is a conventional war, the crisis could enter an intense stage. The definition of an intense crisis is the point at which one side or the other is seriously considering the possibility of a central war and has communicated this fact convincingly to its opponent. Presumably most crises will have been settled before this stage since every rung of the ladder climbed so far has put pressure on both sides to settle. But it is also possible that the exertion of pressure has simply provoked counterpressures. In any case, I wish to illustrate how the scenario might be carried out to a disastrous end.

At this point, the decision-makers are no longer thinking, "Neither side wants war, so the other side must back down." Now they are announcing, "Unless you back down, we will go to war"--a quite different position. Hopefully, no crisis in our lifetime will reach this stage.

The outstanding elements of an intense crisis, probably, are the quasi-ultimatum and the unplanned evacuation. The ultimatum forces the side to which it is addressed to think in terms of real nuclear war. In any case, with or without a quasi-ultimatum, the population of both sides now fears war as an actuality and not as a hypothetical and unreal nightmare. Accordingly people begin to leave target areas. One might define an intense crisis operationally as that time when 10 or 20 per cent of the population of New York City or Moscow has left the city because of fear of war.

The Berlin situation has not come close to this rung of the escalation ladder because the "ultimatums" of Khrushchev have had too long a time interval to generate a sense of intensity.

11. Limited Evacuation. Either the Soviet Union or the United States or both may actually carry through a partial official evacuation of their cities. There is no doubt that, barring an intense crisis, any form of evacuation would not only pose new and immense problems, but could also meet with very great resistance on the part of the population. However, the evacuation order itself might generate this sense of crisis. The effect of the evacuation on the resolve of the people and the decision-makers might be very different. The decision-makers are not likely to be "playing politics" and may feel willing to play a stronger hand if most of the population is, or soon can be, put in a place of relative safety. The people, on the other hand, may become both frightened and resentful. Depending on the details of the crisis, the success of the evacuation, and the appearance of the protective arrangements, the people are as likely as not going to be an influence for moderation, accommodation, or even appeasement. Of course, during the most intense crises, the public will have little say. However, their later reaction, if there is a de-escalation, may be all-important in the ability of the country to meet future crises or even the threat of future crises.

12. Super-ready Status. A ready status may be partial or total. The present handling of SAC is an instance of a partial-ready status. It may be regarded more as a routine precaution than as the highest point that escalation has reached in the tension between the U.S. and the U.S.S.R. However, this is a necessary political background for such partial super-ready status; it has come about by accumulation--five or six years ago a great deal of criticism would have been leveled against it, but nowadays there hardly is any, at least not in the U.S. However, even our routine ready status creates problems with allies and in the U.N. A complete super-ready status would, of course, involve very much more. In particular, it would automatically involve dangerous or costly actions. If it did not, we would be doing these things normally. Strategic forces may be dispersed, leaves cancelled, preventive and routine maintenance halted, training deferred, every possible piece of equipment and unit put in a ready status, and limited war forces deployed. All these measures are expensive to carry out, involve an increase in the probability of inadvertent war, interfere with normal training, and possibly produce other political and military repercussions. One is now saying clearly: "I would not do all of these dangerous and expensive things unless I were willing to go pretty far, perhaps to the limit. Clearly you had better reconsider your estimate as to my resolve." The super-ready status might be accompanied by limited spoofing or

jamming or other acts which tend to degrade the opponent's defensive capability so that he will be less able to retaliate after a surprise attack. While at this stage these acts may not be carried so far as to make a large difference, they still demonstrate one's own resolve and also tend to weaken the resolve of the other side precisely because they are so dangerous. Such preliminary spoofing and jamming are a method of bluntly asking the other side to choose among compromise, a dangerous continuation of the crisis, or immediate escalation to an all-out war.

13. Spectacular Show of Force. The spectacular show of force would involve the actual use of major weapons for show rather than damage or destruction. The harmless detonation high over enemy territory of a big weapon or the delivery of leaflets by ICBM's would fall in this category. Such a dramatic gesture would undoubtedly bring about a mixed public reaction. In the initiating country large numbers would be violently opposed to this type of action regardless of who had manufactured or escalated the underlying crisis. In the threatened nation many would equally strongly demand concessions regardless of all other factors. There are also obvious asymmetries between the United States and the Soviet Union, both in their ability to initiate or resist this tactic. In either case, the nation using such a tactic would have to examine whether it is really ready to go to rung 13 from rung 12 or to provoke its enemy by doing so. At this point, the limited war is merging into the limited or controlled reprisal. As explained previously, one can try to use weapons to achieve limited destruction either to punish the enemy for a previous or immediately intended act (with the intention of establishing a precedent that would deter later provocations), or to intensify the game of chicken to the point where the enemy will become so frightened that he must back down. An act of controlled reprisal or nuclear show of force is intended to be as harmless, yet as arresting, as a guard's "Halt, or I'll shoot", or a naval patrol vessel's shot across the bow of a suspicious vessel.

14. Limited (Tactical) Nuclear War. Much more impressive than a show of force--which is in some sense just a display of technical proficiency--is the actual use of nuclear weapons to destroy or damage. Such use can also be symbolic--but it is a much more convincing symbol.

Let me describe what most analysts think about today when they consider the use of nuclear weapons in a limited war. By and large most professionals--people who have studied these problems--are dead set against the use of nuclear weapons under almost any circumstances. Most of them believe that the weapons should exist, that we should hold them, unless and until something better can be done, but they don't believe that they should be used first. And I

myself, for example, would be very willing to see the U.S. accept the Soviet proposal "Banning the First Use of Nuclear Weapons", at least on paper. I think this helps the Soviets more than it helps us, but I think it helps control the arms race in many ways. But, as with everything else, we want to study this problem, and we want to ask ourselves, "How would we use nuclear weapons if they are going to be used?" Take a limited war situation. One side is losing and decides to use nuclear weapons. It doesn't use them to damage the other side in a way that really hurts, because that really can escalate or get out of control. But it might drop two bombs on two bridges the other side is using. This may not kill any soldiers--but it may hurt the logistics. It doesn't hurt the logistics very much, but it unmistakably tells the enemy something such as, "Look, I've dropped two bombs; having dropped two I may be willing to drop twenty. In other words, I'm crazy or determined, or both. I've demonstrated it. Don't you want to listen to reason? Such an act might escalate. It might produce the desired results. Or the other side might reply in a tit-for-tat position to show that it has not been deterred and then (since it actually is) consider compromising the conventional war rather than exploiting to the full its advantage.

The basic reason for not using a nuclear weapon is not the one that most people assume: That such action would inevitably escalate into an all-out war the first time a nuclear weapon is used. Under most circumstances this will be unlikely. After all, both sides are incredibly scared. When the first side uses a nuclear weapon, both sides are going to be even more scared, and both sides will want to back down. The problem of using nuclear weapons is, first, that precedents are set. If the use of nuclear weapons works in the first war, somebody will try it in a second war. By the third war it may escalate. The second objection is that such use will stimulate the arms race. If anyone uses nuclear weapons, every country may feel it has to get them. Such a use breaks precedents that are very important.

The use of nuclear weapons could probably be made even more frightening if, instead of being launched locally, they were launched strategically, but used locally. Because the same weapons systems would then be used which would be used in a general war, one has somehow communicated to the enemy the fact that he is more willing to go further or be careless of precedents and limitations. Conversely, if one wished to diminish somewhat the possibility of escalation, one would be careful to use only local launchers in the local use of nuclear weapons, such as the relatively short-range missiles owned by the army.

15. "Justifiable" Counterforce Attacks. Such counterforce attacks are not clearly illegal. Either the concept of legality is irrelevant or enough of a case has been made for committing the act that the question of legality or illegality is controversial, or at least is made to seem controversial. For example, it is often possible for one side or the other to actually attack, harm, or otherwise forceably degrade capabilities of the other side in a significant fashion without actually crossing clear-cut jurisdictional lines. One might shoot down a plane outside one's borders but claim that the plane was within one's borders. Or one could destroy a submarine and claim that it made threatening maneuvers. Clandestine or covert acts of sabotage that make a significant difference in the performance of the opponents' defensive system are alegal attacks.

There could be a large-scale campaign to sweep Soviet shipping off the seas, or the Soviets could launch a missile against an isolated allied or U.S. base or aircraft carrier, claiming that a U-2 had flown from it. The Soviets could arrange to have a U.S. missile stationed in Europe shot at them, and then proceed to destroy some of our missiles in return on the grounds that though these missiles were dangerous, we refused to operate them safely and insisted on keeping them on an accidentprone alert status. They might bomb the radar we are supposed to have in Turkey on the grounds that it was used for spying.

A "justifiable" attack should be sufficiently specialized and have sufficient cause so that it could look like a limited provocation with no intention of being all-out, and yet it might significantly degrade our capability and have serious effects on our prestige or morale.

16. Acts which Seriously Degrade Enemy Defenses. One side can stage maneuvers that have the effect of shifting the balance of power by sharply increasing the other side's vulnerability to surprise attack. For example, our warning system has not been built to deal with large-scale peacetime spoofing and jamming if the Soviets institute these on a scale large enough so that we can no longer tell the difference between small training missions and actual attacks. Thus by making the possibility of a successful surprise attack much greater, one succeeds in looking much more threatening. One is, in fact, more threatening. It is quite possible that the spoofing and jamming will take the place of the classical ultimatum or quasi-ultimatum. However, one can make the spoofing and jamming even more frightening by delivering a quasi-ultimatum or ultimatum with it. What can be done about these tactics? For example, if the Soviets use aerial jamming against our early warning lines or BMEWS system, there is little we could do to shoot their planes down, even if we wished. It is simply impossible currently for us to defend these lines actively. However, the Soviets might even be willing to use ship-board

jammers since this would be somewhat less expensive and in some ways more satisfactory. They could even become very aggressive and station a half-dozen ships 50 to 100 miles off our shores and jam our contiguous radar cover. In this case even our hard missile bases might suddenly become vulnerable to surprise attack by Soviet bombers, since this jamming might put the radars out of commission, and they could sneak bombers through.

The Soviets could also increase the pressure on us by stationing missile-launching or small airplane-launching submarines or ships off the coasts at the same time.

17. Evacuation (approximately 70%). At this point one is getting very close to war. It may seem advisable to evacuate everybody from cities that can be conveniently evacuated. One would conjecture that this number was probably between two-thirds and three-fourths of the population. By leaving one-quarter to one-third behind, all the important industries, communications, transportation, and other things that the government might want to continue could be operated. There would be, of course, an enormous loss of the GNP but most of it would be in industries or businesses which were ultimately expendable. In other words, we would have a loss in the rate of our accumulation of wealth and in our standard of living, but the evacuation might not affect national defense preparations very severely.

18. Low-level Strategic Counterforce Attack. The next step would be to actually start destroying portions of the other side's weapons systems, but in a relatively innocuous way so as not to cause much collateral damage. The simplest thing, of course, is to start shooting down equipment which is outside the other's borders. The ideal objects are airplanes, ships, and submarines. One can imagine this going on for quite a while without actually touching off an all-out war or other escalation. One could also imagine it touching off an immediate escalation. One could also attack warning stations much more openly than was considered in the previous rung, or even isolated SAC bomber bases or missile bases. We could, for example, attack the Soviet staging bases in the far north. This would seriously degrade their ability to use their medium bombers, yet it would be an innocuous attack, as compared to other possibilities. Whether or not we could get away with this would depend a great deal upon the strategic equation and the stability of the Soviets, but there are circumstances when this kind of attack would look like a safer tactic than the all-out war or compromise and accommodation.

19. Limited Strategic Attacks Against Property. The next step would obviously be to increase the level of these limited strategic attacks. It is hard to decide at this point what the next

rung really should be. One possibility might be a limited strategic attack at cities, as already discussed in the city-trading concept, presumably after warning had been delivered and the cities evacuated. The purpose would be to destroy property, but not people.

In a modern, wealthy, industrial society, the destruction of wealth does not jeopardize the survival of the community. It is rather like a fine. While it is a punishment, if no one is killed, "it is only money." In fact, it is conceivable that the controlled reprisal concept could get to the point whereby, rather than actually launching the missiles, one simply insisted that the other side donate a fixed sum of money to the U.N. or pay some other kind of ransom. In the controlled reprisal the objective is less to gain the advantage from the ransom than it is to punish the side being coerced.

Rather than cities, the controlled reprisal could involve the destruction of relatively "sanitary-looking" targets such as expensive industrial installations--particularly ones which have a semi-military character, such as gaseous diffusion plants, and which therefore appear to be legitimate military objectives--or could involve attacks with bacteriological or chemical weapons against food or crops. It could even involve incapacitating but basically harmless attacks against population.

20. Complete Evacuation (approximately 95%). At this point, one is on the verge of, or actually in, a war. If at all possible, each of the two sides is likely to evacuate its cities almost completely, leaving five or ten percent of the population behind to operate essential facilities. This, of course, would cause enormous political, social, economic, and psychological problems. It is possible that in the United States, some state of martial law might have to be declared, and some rights under the Constitution suspended.

The great danger of a complete evacuation is that it might touch off an attack by the other side. One must then have some confidence in one's Type I Deterrence, or in the prudence of the opponent, to carry through such an operation. However, with all its dangers, it may be safer than an all-out attack with the almost certain reprisal that such an attack would bring. The advantage of evacuation as a deterrent (threat) is that it is likely to be more credible than the mere threat of attack while at the same time mitigating the effects of the war which has now become likely. It should, of course, be realized there might have been a relatively large-scale evacuation before this, in which the majority of the people had been evacuated. However, even if we left only 30% of the people in a city, we would still have in the neighborhood of 20 million obvious hostages to Soviet actions. If we reduced these 20 million hostages to two, three, or four million, then we would have put our potential losses into the classical arenas of World War I and World War II.

This could make quite convincing the thought we are willing to go to war if the other side is unwilling to compromise. We are, of course, still not eager to go to war. Nobody is anxious to lose three or four million people, but even more we are not anxious to lose these empty cities.

21. Formal Declaration of War. A possibility that is almost completely overlooked in modern defense planning, but one which is possibly less improbable than many that are looked at, is that, as a result of a provocation we will give not the quasi-ultimatums or implicit ultimatums considered earlier, but explicit ultimatums with a timetable, or even a formal declaration of war on the other side. Such an ultimatum or declaration of war might not be followed immediately by a knockout blow, but as in World War II it might be followed by a phony war period, in which there was some limited tactical or strategic harassment but no all-out actions. The reason for this possibility is of course quite clear. During the tense period both sides presumably put their forces into a state of super-preparation for defense and attack. For example both the United States and the Soviet Union might disperse their strategic forces to the approximately 500 airfields that are available. A disarming attack now would become very difficult. How difficult depends on details which cannot be discussed here. Given the strength of the balance of terror and the general fear on both sides, it would not be at all incredible if both nations were at this point very cautious. The formal declaration of war could be either an escalation or a de-escalation. In both cases it makes it clear that the side issuing the declaration has no immediate intentions of attacking⁽²⁷⁾ but would like some time to talk, consider, prepare, or just wait, and intends to keep the issue open during that time.

22. A Partial Disarming Attack. The next possibility is quite close to some of the things we have just mentioned in our discussion of simple models. Once one has opened up the possibility of trans-attack and post-attack deterrence, one may consider other types of attacks, for example, what could be called the partial disarming attack. In the counterforce-plus-avoidance attack discussed previously, one of the major arguments for this attack was that one did not lose much in the narrow military calculations and yet one did increase enormously the possibility for post-attack blackmail to work. In the disarming attack one may go along the same path even further. One may accept tremendous military disadvantages in order to improve the possibilities for negotiation. One can make an attack which destroyed a fair portion of the Soviet's first-strike forces and even some of their second-strike forces but carefully avoided all "emotion-arousing" targets. This would make it very disadvantageous for the Soviets to launch a counterstrike and would make it more probable that we would continue with an all-out strike on the rest of the second-and first-strike forces if the Soviets were not

reasonable, and, of course, vice-versa. If one side had the kind of strategic superiority that some have claimed for the U.S., then he could make his case more convincing by giving the other side very detailed calculations of what the war would look like simultaneously with the attack rather than the kind of vague, general hints of strategic superiority that are appropriate for the lower rungs. It is difficult to believe the other side would not be willing to look at these calculations. Of course, the other side might launch some missiles in a reflex of anger or because this is what its war plans call for, and the attacking side might have to be willing to accept that damage if it wanted to avoid further escalation. So it might turn out that if things were settled at this point, the initiating side might suffer many, many more casualties than the defending side, even though the initiating side both seized and kept a military advantage. It is also possible that the initiating side would insist on a final counter-reprisal before agreeing to a cease fire. As explained earlier (pages 46 to 47) the tit-tat-tit sequence may be as stable as a number of tit-tat sequences.

A scenario for such a disarming attack might go as follows: Because of some incident or crisis, or as part of a planned aggression, the Soviets might threaten a massive attack on Europe and refuse to back down even though we went through the temporizing measures of evacuating our cities, alerting our SAC, and augmenting our air defense. The Soviets might believe we would be deterred from attacking them. They might have calculated that even if we launched an all-out attack against their strategic forces, they could still destroy 50 to 100 partially emptied cities in a retaliatory blow. Suppose the Soviets were to launch a large conventional attack on Europe and we were to fight back with augmented conventional forces. There would then be two reasonable possibilities: (1) we hold, or (2) we impede the Soviet advance but do not halt it. Assume the latter possibility and carry the scenario to the point at which a military debacle for the United States and its allies seems imminent. At this point we would have a number of choices: we could use nuclear weapons in the combat zone and hope that the resulting bomb damage to civilians (from either the enemy's weapons or from ours) would not be too great and that it would not escalate into either all-out war or strategic bombing in Europe; we could attack the Soviet Union; or, finally, we could accept defeat. Suppose now that we are not deterred by the Soviet threat of destroying 50 to 100 of our empty cities. We might believe the studies that indicate we could recover in about ten years from such a debacle. Perhaps we would argue that if the Soviets are going to behave this way now, they will behave even worse after they have added Europe's resources to their own, and that this is as good a time as any to stop them--delay will only make them stronger and us weaker. Perhaps we would not stop to read studies and make calculations but simply act out of a sense of obligation and outrage. Whatever the reason, suppose we were to decide to attack the Soviet Union.

While we would be reluctantly forced to risk those "empty" cities, we would in no sense be eager to lose them. In such circumstances we might most sensibly limit our actions in a very careful and controlled fashion. We might hit missile bases in Siberia, Soviet bomber bases away from cities, identified submarines at sea, and in general any target that does not involve the destruction of important non-military assets, taking particular care to avoid civilians. If the Soviets happened to have a bomber base in a city such as Leningrad or Moscow, we might deliberately refrain from attacking it, even though this self-restraint might result in our suffering more damage in the long run. Alternatively, if we did attack such a base, we would probably use relatively low-yield kiloton bombs, rather than multi-megaton bombs and thus greatly limit the bonus damage to the neighboring city. We might simultaneously point out to the Soviets (28) that since we had (successfully) damaged their strategic forces in our strike, there were now no possible ways in which they could win the war. We would point out that our only war aim is the removal of their threat against Europe. We would ask, "Do you really prefer to start a city exchange rather than accept our peace terms? Is this the right time for you to start trading cities when we have such a large military superiority?"

Under the conditions of the early sixties, (29) even if our first strike were only moderately successful, it should be successful enough under these hypothetical circumstances for the Soviets to have no reasonable choice, since if they continue the war they will be beaten. The only rational thing for them to do at this point would be to sign a truce. It is, of course, implausible that human beings would be this rational, even in the case of the relatively self-controlled Soviets. But even if they struck back and hostilities continued for a short time, they might be willing to limit their counterblow to counterforce targets as we did. They might do this because it would be clear that should the war end in stalemate, it would be much less costly to both sides if each were careful about how it uses its strategic forces. Care on their part would be made more probable by our own care and the limited objectives which we would have proclaimed. Moreover, even if events should go wrong and the war should degenerate into a city-busting phase after 10 or 20 hours, the attacker will have gone a great distance in achieving his "limited damage" objective. After 10 or 20 hours of war much of the defender's forces would have been destroyed, used up in the controlled phase of the war, or degraded in effectiveness because of impairment of important parts of his system. (30)

The pressures upon our European allies to limit a general war would be even stronger than upon the United States. In most wars, because of proximity, it would be much easier for the Soviets to destroy Europe than to destroy the United States. It might even be sensible in some cases for us to encourage the Europeans to declare

some degree of armed or even unarmed neutrality, depending on our tactics and strategy, and their capabilities. Because of the development of the ICBM and Polaris submarine, and because of vulnerability and warning considerations and the difficulty of maintaining secrecy in operations, European-based forces will not be as valuable military assets to the NATO alliance as was true in the past. For this reason, a European declaration of neutrality or military disengagement on the open-city⁽³¹⁾ model might in some circumstances be costly but still militarily acceptable. There is also a possible bonus in some degree of European "abstention." To the extent that the Europeans can preserve some independent military or political bargaining power, they may represent a third force which, after the U.S. and Soviets have attacked each other's military forces, may be able to exert an arbitration-type pressure on both sides to be reasonable in their negotiations. In a curious way the existence of an armed China might do the same. Neither the Soviet Union nor the United States is likely to relish the thought that if they knock each other out, the Chinese Communists will run away with the prize.

23. Counterforce Plus Avoidance Attack. This attack differs from the limited disarming attack by not being so scrupulous about avoiding almost completely any possible collateral damage to cities, and by even possibly deliberately sparing a certain number of second-strike forces. Here one mounts a much larger counterforce attack, trying to pick up everything that doesn't involve major collateral damage to civilians. In the case of a Soviet attack on the United States, this would include such things as hitting Tucson (a city of 250 thousand population), which is completely ringed with Titans, but it would probably mean avoiding Brooklyn Navy Yard, Norfolk Navy Yard, and the Pentagon in Washington. If they did hit these targets or any SAC bases near very large cities, they could drop 20 kilotons, rather than 20 megatons on these military targets in order to keep down the collateral carnage. In an attack like this, one can almost, of course, assume a counterattack, but one can still try to use threat of further escalation into countervalue wars to limit or intimidate the defender's response.

One of the attractions of counterforce warfare of either rung 22 or 23 is that it looks like traditional warfare. It is the military fighting against the military, rather than the military destroying helpless civilians. It fits in with the "just war" doctrine.⁽³²⁾

This analogy can be stretched too far because, if one wins the counterforce warfare, it is not necessarily going to be true that the defeated would allow itself to be occupied by military forces or even that the victor has the military forces to occupy the defeated. It is likely that the victor will have to threaten or actually destroy some of the defeated's cities. However, this last,

of course, may not occur. While the counterforce is in a sense a preliminary to the bombardment of cities, and the possibility of controlled reprisal is always there, it is also true that as in previous wars one could expect the defeated to surrender when they can no longer protect themselves, or if they still have some ability to inflict damage on the superior side then there should be a compromise peace.

24. Limited Strategic Attacks on Population. This is the highest specific rung on the ladder. Such attacks could take the much-discussed form of city-trading, fallout attacks on population, or even biological or bacteriological attacks (possibly partially disguised or anonymous in order to somewhat limit the provocation). It is difficult to believe that such attacks could occur without touching off some kind of all-out war, but if the balance of terror is sufficiently stable, even this could occur and still not necessarily escalate much.

25. Some Other Kind of General War. This could also be a war of pure resolve--such as city-trading, one per day--already discussed. It should also be clear to the reader that there are many kinds of wars other than the "cool bargaining ones just considered and the irrational fury of the all-out countervalue spasm. Some of them have already been discussed in the first half of this chapter. Nothing in the discussion is intended to imply that these other wars or even the spasm war won't occur--only that they are not inevitable, or necessarily plausible.

It is also possible, as explained, to have "all-out but controlled wars. The term "all-out" is put in quotes to emphasize that this is not necessarily the "spasm" war in which each side would strike indiscriminately against the other's cities and military bases. The "all-out" refers to the level of effort and not to whether or not there is discrimination in targeting or negotiation. In this "rational," "all-out" but controlled war, military action is accompanied by threats and promises, and the military operations themselves are restricted to those that contribute to attaining victory or to limiting the damage the enemy can do. Indeed, such a controlled "all-out" war or a controlled reprisal war is almost a logical but not an inevitable outcome of an international game of chicken that is still being conducted "rationally."

From these examples one can tell that there are many scales and types of limited or "all-out" war or violence which could terminate an international game of chicken. But they also introduce an element lacking in the game, and in two respects they would be more like a strike. Unlike the game of chicken, there would be an immediate expenditure and destruction of men and material. Either side could back down after a limited response and still feel that its opponent

did not get away scot-free. Some degree of both honor and deterrence might thus be preserved by the use of such limited threats and actions. In addition, even a small and not overwhelmingly credible threat of escalation to the higher rungs might still provide enough deterrence for most situations.

Aftermath

Wherever we are on the ladder, eventually, of course, we will get off it. We may get off after rung 2; we may not get off until rung 21. In any case there will be an aftermath of having started to climb the ladder, and the term is intended to include not only the aftermath of an all-out thermonuclear war, but the aftermath of other situations not involving the highest level of violence.

TABLE 16

AFTERMATHS OF DE-ESCALATION FROM LOWER RUNGS

1. Fear and relief
2. Anger, tension, and hostility
3. Rigidity, soberness, and demoralization
4. Education for innovation
5. Preparations, reorganization, mobilization
6. Arms race, competition, detente, entente, agreement
alliance, or condominium
7. New alignments

The aftermath of the de-escalation from the lower rungs is shown in Table 16. First there will be both fear and relief-- fear because the crisis could have been worse, relief because it was not. There is likely to be anger, tension, and hostility. After all, the two countries have been threatening to destroy each other. As a result of both one and two, some people will become more rigid in their determination not to give in; others will be sobered by the closeness with which they came to a more dangerous situation, and, finally, still others will be demoralized, anxious at all costs to avoid such a strain again.

In any case, almost everybody will be looking for ways to improve the situation. They will be interested in innovation. The policy of inertia, of doing the same thing in the future that we did in the past, will no longer look as attractive because it will not be as attractive. As a result there will be preparations for other policies; there will be reorganizations; there may even be mobilization. Between the two opponents the status is also likely to be very different. As nations they may have an arms race; they

may compete more fiercely. Or, both sides may become intensely aware of the great threat posed by nuclear weapons; their previous feeling of "nuclear incredulity" may be shattered, and the two rivals may even negotiate agreements, alliances or condominiums. Or, less dramatically, the result of a crisis might be increased cooperation--possibly even detente and increased competition. It might be well to be in a position to take full advantage of either possibility, exploiting a subsequent detente to achieve real stability or an accelerated arms race to achieve "superiority." Aftermath not only includes relations between the opponents but also other internal and external relations. As we know from experience, serious crises can disrupt alliances, destroy morale, and render ineffective seemingly adequate capabilities. Alliances may also be increased in cohesiveness rather than decreased; there may be actual accretions rather than desertions. All of these changes may or may not be formally acknowledged.

TABLE 17

AFTERMATHS OF DE-ESCALATION FROM UPPER RUNGS

1. Death and destruction
2. Formal cease-fires and peace treaties
3. All lower-rung aftermaths intensified
4. Drastic social and political changes
5. Disjunctive "solutions"

From the upper rungs, of course, the effects of de-escalation will be even greater. There will have been death and destruction; there are likely to be formal cease-fires and peace treaties. As a result of one and two, all of the lower-rung aftermaths are intensified. They will occur in a stronger form simply because death and destruction has a great emotional impact, and formal cease-fires and peace treaties allow for even greater changes in the international order. There may be drastic social and political changes both internal and external.

Finally, there may be disjunctive solutions to the conflict which precipitated the crisis, solutions which could not have been arrived at or which would have been unlikely by slow growth of the current system, solutions which represent a sharp break with the past. The solutions, of course, may not be desirable, and they may only lead to new troubles, but they represent at least a temporary resolution of the dispute.

In theory one can climb the ladder either rapidly or slowly. If one is deliberately escalating rapidly, it is presumably with the intention of panicking one's opponent, so that he collapses, possibly totally. If one is going slowly, with many pauses at each rung, this indicates more caution, but also gives the other side a chance to settle the issue, to be induced to call off his provocation which has provoked the first side's escalation.

On the escalation ladder one wishes to distinguish between private threats, informal threats, public threats, and formal threats. All of these have different characters in that they involve different amounts of loss of face for one side or the other if it accedes or backs down.

We also should study de-escalation--how to climb down, and even off, the ladder. Normally this would be done by a settlement of dispute, but sometimes unilateral measures can be helpful. These may relax tension to the point where it is easier to settle the dispute or leave it unresolved, but less dangerous. Typical de-escalation gestures include: a reversal of a previous escalation move, the settling of another dispute, the freeing of prisoners, conciliatory statements, the replacement of a "hard key official" by a "softer" or more flexible individual, etc.

It is also worth considering partial de-escalation. There could be a Soviet provocation, followed by a controlled reprisal; neither side backs down, but fear overtakes both sides, and the situation de-escalates to a lower rung such as a local war.

We study escalation ladders partly because each rung is important by itself as an alternative or possibility, and partly because every action must be considered in a context of what may have preceded it or followed it. In considering each rung, we must ask ourselves not only how the enemy will react to our actions, but also how neutrals, allies, and even our own people will react. For example, we might wish to choose our tactics so as to increase the degree of tension among the American people or our allies without trying to affect the Soviet Union (because we wish to mobilize or increase our strength or resolve without seeming bellicose or threatening to our opponent). It is also possible that we might wish to make moves which appear relatively innocuous to our own side and neutrals but very threatening to the Soviets. Finally, we wish to consider the long-run effects of each move on the arms race, our future ability to meet crises, the resolve and morale of our opponents, and so on.

It is because each tactic must be considered in a broad context that rather detailed decisions must often be made at the national level. This goes completely counter to the American tradition of

giving the man on the spot the utmost flexibility and responsibility. Under current conditions, however, a less detailed and accurate knowledge of things on the spot can more than be made up by greater and more informed consideration of the broader issues. Therefore, more decisions must be made from a national or international point of view even if this means that local or parochial considerations are inadequately considered. However, to the extent that decisions cannot be made easily because the upper levels do not have the information and the lower levels do not have the authority, decisions are likely not to be made at all--or more accurately, they will be made but by default.

TABLE 18

FOUR OBJECTIONS TO UPPER RUNGS OF ESCALATION LADDER

1. Assumes rationality
2. Ignores ambiguity and uncertainty
3. Acceptable alternatives
4. Long-run instability

In discussing the upper rungs of the escalation ladder, people raise certain objections. I have listed in table 18 what are, in my opinion, the four most important objections. They are listed in order of increasing importance. However, before discussing the objections in Table 18 it is worth making a comment on the question of the realism of the escalation ladder. It should be clear that any particular event described in the ladder could happen physically. The only question is, "How likely is the rung?" This last question must have some relation to such questions as, "What are the likely consequences?" "Will they inevitably be all-out war?" And if all-out, "Will the war be of a spasm type?" Nobody has any experience on these matters, and in that sense it is a completely open question.

The first objection is that the escalation ladder presents an excessively rational sequence of events. That is, how can you assume that people will actually do this kind of thing, that they will think that well, that they will be that cool and collected--they're not computers. Then there are always some remarks about the icy rationality of the Rand Corporation or the Hudson Institute. I sometimes answer, "Do you prefer warm human error? Or an impassioned mistake?" However, their worries are soundly based on an important phenomenon. Both in normal circumstances and under stress and strain, decision-makers may not be rational. However, so far as I know, no professional who studies these problems really assumes the decision-makers are very rational. So far as they assume anything

of this sort, they assume that the decision-makers are not wildly irrational. That is quite a different assumption than the assumption of rationality.

The next objection is that the discussion underestimates the effect of ambiguity. Think of the city-trading notion. How do you know when two cities are equal for trading? Is the trade based on population, on wealth, on percent of GNP? This is a very strong point, and, in general, it is correct. The city-trading notion also seems far-fetched to me. In the real world, if you did anything like that, you would be carrying out some sort of punishment--you might blow up a dam, a gaseous diffusion plant, or an isolated military base to express displeasure.

The ambiguity problem is actually more complicated than is indicated above. There is not only the question of what is an equitable tit-for-tat exchange, but also the question of whether each side understands what the other's intention is when he takes any particular step on the escalation ladder. For example, one side might mobilize simply in order to signal the other side that it is tough, and the other side might read that as an actual intention to go to war, and therefore it may pre-empt. It might do this not because it thinks that the first side will go to war in weeks, months, or years, but immediately. The possibility for such misunderstandings is very great, and in certain circumstances could be useful. That is, given the size of the stake, there will be a tendency for each side to act conservatively--to overestimate the resolve and intensity of purpose of its opponent. This increases the pressure for compromise. It also increases the possibility of deterring frivolous escalations up the ladder.

The problems of communication about the purpose of escalation can be contrasted with the problem of diplomatic communication in the 18th and 19th centuries. In those days there was a very precise language which went more or less like this:

1. His majesty's government is not uninterested in this problem. (There is a vague implication that we might go to war--say with 0.01 probability.)
2. His majesty's government is interested in this problem. (There now exists 0.05 probability of recourse to war.)
3. His majesty's government is concerned. (0.1 probability of war.)
4. His majesty's government is vitally interested. (0.25 probability of war.)

5. His majesty's government will not be responsible for the consequences. (There is 0.5 probability of war: perhaps even worse--the statement may be regarded as an actual ultimatum.)

There are two reasons why such a precise language and communication was effective in the 18th and 19th centuries. First, when it was used all sides recognized that war was really possible. Secondly, such language in the past had actually been followed by war--there were enough precedents to make clear the implications of the language. We have no such precedents today. The probability of war is low, and no nation has taken steps on the escalation ladder and then followed with the use of nuclear weapons. Therefore, it is not clear what a given gesture on the escalation ladder means. Steps on the upper rungs of the escalation ladder can be contrasted with the conditions under which one person sues another in court. If it were very, very cheap for one person to sue another and the results of a suit were reasonably predictable, then there would be very few cases settled out of court. One might just as well go to court and sue. Assume now that it is fairly expensive or risky to sue--but not ridiculously so. In that case there is a real pressure to settle out of court because one wants to eliminate the cost and uncertainties of the suit, and yet, if either party refuses to settle, both will end up in court. If, however, the cost of suing is incredibly high or risky, then there is almost no credible way to threaten the suit, and one expects very few cases either to be settled out of court or to actually go to court. However, a few could still get to court by means of something like the escalation ladder, and some others could be settled by threat of such escalation. The suit really isn't worth it, but it is important to threaten it credibly in order to get any sanctions on the other side.

In other words, the ability to hypothecate force even modestly, or accurately, or even at all depends to some extent, as we mentioned previously, on the willingness to use force in order to test the calculations and prevent extreme bluffing. There are other kinds of ambiguities and uncertainties. Let us consider an example: Assume that P blew up a bridge in Q's territory. Q might read this in several ways: (1) it was simply an accidental firing; (2) it was an intention to hit something much more important, but it went astray; (3) it was the first missile of an attack, and somebody did not obey firing discipline and fired early; (4) P really wanted to destroy the bridge because he's trying to degrade Q's logistics; (5) P really wanted to destroy the bridge as a symbol that he might be willing to do more damage later.

Now according to the way Q reads this, he will act differently. P may or may not wish Q to read it accurately. That is P may intend the bombing partly as a symbol of resolve, but he also wants Q to

read it as possibly an intention, or as nervousness, in order to scare Q more. This way P puts it up to Q whether Q should pre-empt or back down. It must always be remembered that the basic purpose of climbing the escalation ladder is to present the following proposition to the other side: "You really don't want to escalate further because it's too dangerous; in fact, we don't even want to stay where we are because it's dangerous; therefore, you'd better back down."

The next most important objection is that, "There ought to be acceptable alternatives. There just has to be a better way." Let's consider possible better ways. I've already mentioned that appeasement, accommodation, or compromise might be better. These are perfectly reasonable alternatives to consider; however they might also be worse. There are many cases in history where accommodation and flexibility not only prevented war, but led to detente, entente, and friendliness. There are also cases when exactly the opposite occurred where appeasement, by making weakness clear, provoked the other side to make greater demands. Appeasement may also cause the appeasing side to become unnecessarily rigid if it comes to the conclusion that appeasement does not pay or develops moral objections to the appeasement. This possibility should not be surprising. Extreme policies may produce extreme reactions. What happens in any specific case will depend on the nature and degree of the appeasement and on the nature of the two opponents. The slogan "appeasement never pays" is a misleading summary of history, (there are many examples of successful appeasement) but it is an understandable and almost probable legacy of unwise appeasement.

The other slogan that "there is no alternative to peace" is also misleading. If it means anything, it means "peace at any price" and its advocates should so state it. A very unjust peace may be worse than minor wars and better than a major war. However, an attempt to impose an unjust peace may stir reactions that produce major wars because of popular revulsion or refusal by the opposition to surrender under dishonorable conditions. One might accept some bad peacees to avoid worse wars; but the choices may not always be presented this simply. In any case, mutual or other kind of homicide will not be avoided by slogans or by good intentions.

E. Alternatives to Present System

Many have objected that the long-run instability of the current system or order makes it extremely difficult to imagine this system lasting very long. One can only agree; however, the objection is not to the strategy. It is to the basic model--two countries armed to the teeth and pushing each other around: that will blow up in the long, and maybe short, run.

Almost any intellectual or even informed audience in the United States will nod approval to a speaker who doubts that the current system will last to, say, the year 2000. That is, most people--at least those who attend serious forums--are willing to go along with this estimate. If one believes that the system will not last, then one must also believe that it will change. While this may sound like a tautology, startlingly, many people who accept the first half of the statement strongly reject the second half. If one at least recognizes the high probability of change, certain questions arise: How will the change occur? How violently? Can we influence the change deliberately? And in what direction is the change likely to go?

In Table 19 below, I have listed a number of possibilities. The current system might be stabilized with minor modifications. Nations might become cautious, careful, and skillful. Prudent boldness might be replaced by bold prudence. But otherwise, the current system of deterrence, defense, national egoism, and so on might continue more or less as it is.

TABLE 19

HOW WILL THE TWENTY-FIRST CENTURY BEGIN?

1. Minor modification of current system?
2. All-out war system withered away?
 - A. Rule of Law
 - B. Rule of fait accompli (sub-limited war)
 - C. Instrumental Wars
 - D. Agonistic wars (limited, ritualistic or symbolic)
3. Basic change in system?
 - A. Bloc system with restraints and rituals
 - B. Community sanctions
 - C. Condominiums
 - D. Concert of (large or small) powers
 - E. "World government" (empire?)
4. Elimination of weapons of mass destruction?
 - A. By agreement
 - B. By revulsion
 - C. By armageddon

The war system might simply wither away; that is, nations would no longer fight national wars or would cease to threaten or fight large nuclear wars. There are various ways in which the war system might wither away. Nations might resolve disputes according to regularized procedures involving arbitration, adjudication and law courts, even though there are no sanctions, or explicit international military sanctions at least, to compel them to do this. Many think such a rule of law could be brought about by voluntary agreement. I think it is most unlikely, but I suspect that at least the area covered by the rule of law can be increased, which would be very useful.

The next possibility is that disputes might be settled through the use of violence, but sub-limited violence; that is, considerably below the level of today's concept of limited war. This may involve the use of faits accomplis, coups d'etat, terror, subversion, guerrilla warfare, bribery, propaganda and the like, as normal or allowable instruments to be used as a continuation of policy by other means. There are sharp limits to what can be done by the use of such tools. As Samuel P. Huntington has said:(33)

Insurrection and subversion are primarily the weapons of indigenous antigovernments. Foreign governments, of course, may encourage antigovernments. Intervention by one government against another, however, has the potentialities and the limitations of intervention by outside personnel and money in a local election campaign. Though it can influence the result, it cannot create support where the basis for that support does not already exist, and it cannot reverse a drastically unfavorable balance of forces within the contested area. Intervention on behalf of an established government, moreover, is usually easier than intervention against it. Traditional liberal thinking has often been criticized for analyzing war and international relations in terms of the ideas and categories of domestic politics. The doctrines of la guerre revolutionnaire and indirect aggression, on the other hand, tend to apply to domestic political struggles the assumptions and concepts of international politics. Domestic violence, obviously, is influenced by the intensity and nature of international conflict, but it cannot be explained simply as the result of that conflict.

Where the disputes cannot be satisfactorily settled or resolved by the use of such instruments, one may simply accept the status quo. Many believe that this will happen.

Or, we may have instrumental wars. There are wars which are waged for "profit." It is possible that both sides may be mutually restrained enough so that they don't get into a totally destructive

conflict, in which both will be destroyed, simply because to do so is irrational and there is sufficient agreement on limits and constraints to prevent excessive escalation. This is the usual concept of limited war. Actually, limits are likely to have both agonistic, that is, war conducted according to norms, (as discussed below) as well as instrumental motivations if they are to be reliable. So it is good to strengthen the instrumental sanctions by agonistic sanctions. In a wartime situation, if both sides are being truly pragmatic or opportunistic, then the chance that a miscalculation, mistake, or inadvertence will cause a disaster will eventually become quite large.

It may be possible that the revulsion and the restraints against the use of nuclear weapons will grow to the point where even conflicts with conventional weapons will be deterred not only by fear that they may escalate into nuclear war, but also by moral or religious sanctions. As a result, there may emerge what has been called agonistic war. (34) The various kinds of limited war that are so widely discussed in the literature are examples of agonistic wars. Such wars are possible. Indeed, nations might display as much good sense as the other vertebrates seem to show. While other vertebrates do fight among themselves, fights between individuals of the same species, according to Eibl-Eibesfeldt, (35) almost never end in death and rarely result in serious injury to either combatant. Such fights are, in fact, often highly ritualized and more nearly resemble a tournament than a mortal struggle. If this were not the case--if the losers were killed or seriously injured--fighting would have threatened continuation of the species.

Ritualized dueling systems or symbolic violence might also be possible. These would involve fairly large-scale violence, but not enough to jeopardize the future of the contestants or the race. To a certain extent, this is the norm for fighting among various species, including man. This will be discussed in greater detail in Appendix 1.

We have mentioned that, by effecting some changes in the behavior of nations, there are several ways in which the current system might survive for a long time more or less unchanged. There may, however, also be basic changes in the structure of the system. For example, all nations might organize in bloc systems, each bloc responsible for the good behavior of its members. Between blocs each group would behave with great restraint or use ritualized techniques of the less violent sort for resolving disputes. Such a system might indeed last a long time, since each bloc would have little to gain from desperate quarrels with the others, and since reckless adventurers are not so likely to get control of large blocs as of individual nations.

Another possibility grows out of modern technology. The missile is a particularly anonymous weapon, and, unless there are very elaborate systems for monitoring firings, it will be difficult to tell who fired a missile. In fact, even with elaborate monitoring systems, if the firings occur from outer space or from mobile platforms at sea, it will still be difficult to tell which nation fires a missile. The possibility of such anonymity could cause some extreme problems; it may also act as a regulating and stabilizing influence. For example, if a nation behaved very badly and thus put the international order into jeopardy, it might expect to be the recipient of an occasional anonymous attack from some other nation which was disturbed by the bad behavior (the retaliating nation might not necessarily be the aggrieved party). To the extent that it could not deduce or guess which nation attacked it, the nation which behaves badly would have to face the possibility of continuing sanctions if it continues to behave badly.

There is also a possibility of condominiums, or formal arrangements between the larger powers, with sanctions regulating the use of weapons and controlling disputes among less responsible powers. So long as the larger powers do not seriously differ, it should be possible to prevent the smaller powers from rocking the boat or exacerbating disputes to a point where they become dangerous to the larger powers. In some sense, the original formation of the United Nations had some aspects of a condominium wherein the five larger powers were more or less expected to keep the peace. While the original expectations have not been realized, they still might be. There is also the possibility of a less formal arrangement along the lines of the European Concert of Powers before 1914.

In 1914, five large powers, England, France, Germany, Italy, and Russia, had a great deal of influence on international affairs and consulted together on most questions. Two other large powers, Japan and the U.S., were occasionally consulted. Such a consultative arrangement might be made again and even be formalized in a confederation.

Another possibility is that the concert be effectively dominated by the small nations. It might be easier for the great powers to shift authority and responsibility to these relative neutrals than to agree among themselves on how to administrate affairs.

At the extreme is the possibility of a world federation or a world government. This might look more like a World Empire because it is more likely to be dominated by one or a few powers with imperialistic traits than to be a government by consent, as in Switzerland or the United States. On the one hand, if such a world organization allows secession, it is difficult to see how the

the crucial arms control requirements could be successfully met. On the other hand, if secession is not allowed, the government could hardly be democratic and peaceful. Among the disparate people and nations of the world, some will probably insist on going their own way; they will greatly resent any centralized interference in their affairs. Even a homogeneous country like the United States could not avoid a bloody civil war over states' rights. A world government would have great difficulty in enforcing control by consent especially after the unifying influence--fear of the arms race--diminished or disappeared.

Finally, there is a possibility that the tools of modern warfare will be destroyed. This seems to be impossible to achieve reliably by agreement, especially since even if the tools of war were destroyed, the knowledge would remain. The instabilities of nuclear disarmament are such that it is easy to imagine a modern force of mass destruction being rebuilt. Furthermore, without modern air defense systems, ordinary transport planes would make very effective bombers. Indeed, many peacetime products and tools of industry can be very effective tools of warfare in a disarmed world, but it is certainly not difficult to kill a man with a plowshare if he doesn't have a sword. But the tools and knowledge of modern war might disappear, by and large, in a thermonuclear disaster which would create such a revulsion against modern weapons as to prevent their replacement for some time.

Some possible modes of changes are listed in Table 20 below:

TABLE 20

HOW DO "WE" GET THERE?

1. Natural Evolution	}	"Peacefully"
2. Aided Evolution		
3. Negotiation		
4. Crises and Small Wars	}	Violently
5. "Controlled" Wars		
6. "Armageddons"		

We probably must accept the notion that the world as we know it is passing from the stage of history, and that attempts to preserve this 500-year-old nation-state system would probably be as futile as the earlier attempts of some of the small German or Italian states to stave off the unification of their countries. If we wish to influence these coming changes, we simply must learn much more about existing and potential international orders--and learn fast.

Changes can occur through evolutionary or revolutionary means. The evolutionary process includes such means as negotiation, economic and political developments, and cultural adaptation. Revolutionary changes are rarely achieved around a peaceful conference table. They are usually brought about in the wake of war or in the shock of severe crises--Munich, Hungary, Suez--perhaps Berlin.

We have access to more than a five-foot shelf of books and studies about the possibilities of evolutionary change, but not one really modern definitive study of the revolutionary routes to a radical change in international relations--and this is the most revolutionary period in history. There are gaps in both, but the biggest gap now needs some belated attention.

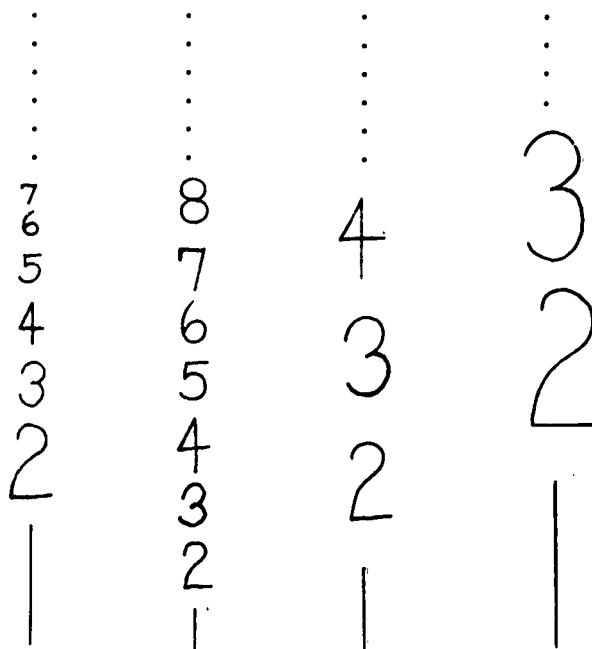
While fully recognizing the importance of doing our best to negotiate the transition to a new order peacefully, giving and taking in a reasonable spirit, we cannot afford to risk coming unprepared to the threshold of violent change or to the opportunities offered by a sobering crisis. We must be prepared to fight, survive, and terminate a war if one occurs, or to make use of a crisis to reshape the international order to the needs of free men, and to prevent or mitigate the many possible deleterious results and risks that could stem from a crisis--whether inadvertent or deliberately manipulated. Thus, by thinking ahead about future possibilities and alternatives, we can hope to improve our ability to defend and extend our values as well as to survive physically should we unfortunately reach the point of violence. We may then know how to terminate a conflict or resolve a crisis in a way designed in advance to favor a new and more workable organization of man's activities, and also to prevent a repetition of cataclysmic crises or war.

Karl Marx once described war as "the midwife of history." Without appealing to him as an authority, I would like to generalize his statement to "wars and crises are the midwives of history." For our own survival, we should surely learn how to deliver a healthy baby as safely as possible since, in a very real sense, our world is in labor.

If, however, one really believes that there is a reasonably good chance that the world is going to change drastically in the not too distant future and that such change is as likely to occur through crises, acts of violence, and war as through peaceful evolution, then one of the highest priority jobs of our government is to be able to cope with this change, to influence it, to make the transition as orderly as possible, and to increase the likelihood that the outcome will be acceptable to us. We must, therefore, evaluate the skill of any government department such as the Executive Office, the Office of Emergency Planning, the Department of Defense, or the Secretary of State on the basis of such things as the escalation ladder. The next chart indicates possible kinds of skills which the various decision-makers and bureaucracies can have.

Chart 4

WHERE SHOULD THE EMPHASIS BE?



The first column indicates the amount of skill and attention that is customary, illustrating the fact that many officials are very good in their day-by-day jobs, are reasonably good in an ostensible or even real crisis, understand something about gestures, know how to react to acts of violence, even have some expertise in modest mobilization; but their general knowledge, experience, interest, and background begins to fade out at this rung. All of the higher rungs tend to be unthinkable to these officials.

The next column indicates a plausible conjecture. If one tries to increase the skill and interest of the government in the upper echelons of the escalation ladder, one may have to decrease the skills in the lower echelons. This can be dangerous in two ways: first, the lower echelons are, of course, important in themselves, and, secondly, and even more important, being unskilled on the lower rungs may decrease the probability of peaceful transition. However, it is not really necessary for this to happen. While there is some

competition in skills, it is simply not as dramatic as indicated by the second column. Indeed, it is possible to increase skill in the tactics of the upper rungs of the ladder with only a small decrease in the lower echelons. It is even conceivable that, in the attempt to increase our skill in the upper echelons of the ladder, we will increase our skill everywhere, up and down as illustrated by the fourth column.

F. More Simple Models

Against this background, let us consider some more simple models. I will again use some numbers which are undoubtedly exaggerated. But that is only to make the implications and consequences more starkly apparent. Consider first a situation in which the balance of terror is asymmetrical as shown in Table 21 (Q is, of course, still Russia and C is China).

TABLE 21

ASYMMETRICAL TYPE I DETERRENCE

(100 cities of 2,000,000 population each)

Balance of Terror	No. of Invulnerable Missiles		Hostage to Q or C
	P	Q or C	
Near absolute	10,000	2,000	200,000,000
Almost as absolute	10,000	100	200,000,000
Reliable	> 100	50	100,000,000
Reliable enough	> 100	25	50,000,000
Mildly Asymmetric	> 100	10	20,000,000
Asymmetric but workable	> 100	1 - 5	2-10,000,000

We previously considered a case where each side has 1,000 missiles, and we called this "near absolute" deterrence. However, if P acquires an additional 9,000 missiles, he may feel that his extra missiles ought to be worth something. Actually, the extra missiles really don't make any difference since both can overkill, but the notion of an overkill capacity is intellectual and abstract and, hence, may not impress a decision-maker as much as a mathematician.

Many decision-makers will believe that the side having the greater overkill capacity is, in some sense, "ahead." The weaker side may, therefore, want to increase its overkill capacity in order to be "even". In spite of these considerations, there can be a great deal of asymmetry, and there will still be a workable deterrent. Even if P has 100 missiles and Q or C only one invulnerable missile, then Q or C has 2 million hostages. Side P will, in many disputes, be deterred. Note that, if China, in particular, were to get one to five invulnerable missiles, then not only would deterrence between U.S. and China become a two-way street, but the U.S.-S.U. deterrence would be affected. This is particularly important if China were to become independent of the Soviet Union. The United States may be willing to risk losing 10 to 20 percent of its population in a vital dispute with the Soviet Union provided the Chinese do not have nuclear weapons. If the Chinese have nuclear weapons, it might be unwilling to take such a risk against Russia for fear that China would then dominate the international scene. Similarly, the U.S. might be unwilling to risk 10 to 20% of its population in a dispute over a vital issue with China for fear that the Soviets would take us over. Thus, while a Chinese nuclear deterrent might also make the Soviet Union more cautious for many of the same reasons the U.S. is, the Soviets might still gain a strategic advantage in international bargaining should the Chinese develop a nuclear capability. (36)

Let us consider another case. Assume that the missiles are so vulnerable, reliable and dispersed that in a counterforce attack they trade evenly one for one. There would now be tremendous pressures toward an arms race, particularly if either side were uncertain as to how many missiles the other side had. The side with a few more missiles could launch a disarming first strike on the other side, and (in the simple model) it could then attack the other side's cities with impunity. Because a small difference in numbers might be vital, accurate intelligence is critically important. In its absence, the side which can preserve secrecy may bluff. For example, a side with fewer missiles may still start a low-level controlled counterforce campaign as if it expected to be able to destroy all of its opponent's missiles before it used up its own. Such action might make its claim to superiority very credible. Or, it might cast doubt on it. If the attacker was so superior, why didn't he go all-out? However, there could be many reasons for his restraint, and the question would remain open.

If the missiles are traded one for one and both sides have the same number of missiles, say 1,000, then there is still an advantage in striking first. It is true that, if P launches 1,000 missiles at

(36) See Chapter VII for more discussion of the Chinese military and associated deterrence problems.

Q, he has used up all of his missiles in destroying all of Q's missiles, and the strategic balance is still symmetrical. At first sight there would not seem to be any advantage in striking first. This is not quite right. If P strikes Q, then the war has occurred on Q's territory, and, while both of them have been disarmed, Q, not P, has to deal with the problems of collateral damage due to blast, fallout and thermal radiation. P is untouched as yet. This is a powerful reason for striking first, and one which - in theory at least - could also lead to a "reciprocal fear of surprise attack" situation.

This first-strike advantage may still hold even if Q has a superiority of less than 100 missiles, say 50. By launching first, P guarantees that most of the missiles explode on Q's soil, and he only receives the residual attack by Q's surviving 50 missiles. It is not certain that P gains by striking first. If Q strikes first, he will presumably launch only 1,000 missiles at P's 1,000 and hold the extra 50 in reserve. Whether P suffers more damage from the collateral effects of 1,000 missiles aimed at his 1,000 missiles or from the direct effects of 50 missiles aimed at his cities depends on details. While all of the above first-strike advantages must be considered in estimating the stability of any crisis situation, it is doubtful that this kind of first-strike advantage is anywhere as destabilizing as the first-strike advantage which comes from being able to launch a disarming attack.

Let us now introduce another variation in our simple model in order to see what further light we can shed upon the bizarre possibilities inherent in modern deterrent systems. Substitute the assumption of relative rather than complete invulnerability for the missiles. Assume that either side can destroy one of the other's missiles by firing two of its own. (37) This situation is illustrated in Table 22. Superficially this does not change much. If P fired all of its 1,000 missiles at Q and thus used up all of its missiles in destroying only 500 of Q's, Q would "win". Q would have the power to retaliate by complete destruction of all of P's cities. Such an attack, in which P launched all 1,000 of his missiles against Q and destroyed only 500 of Q's missiles, would actually amount to unilateral disarmament by P. It is not the ideal form of unilateral disarmament from the viewpoint of Q since in this act of launching P has exploded 1,000 bombs in Q's territory and as a

(37) In the real world, damage is a complex phenomenon and the best way to render the other side's missiles ineffective may be to attack some of the system elements (pp. 128-130 of OTW) such as command and control, or to damage by means of subtle weapons effects. (See pp. 428-433 of OTW.)

result caused great radioactivity and much collateral damage. Q would have preferred for P to shoot his missiles into the ocean. Therefore, from the viewpoint of P, this is the worst form of unilateral disarmament. He can scarcely expect Q to treat him gently or to be impressed by the act of renunciation. But P's attack is still a form of unilateral disarmament. I emphasize this because old ideas die slowly - and the idea that it is always useful to shoot at the enemy's military forces is such an old idea; it may or may not be useful in practice, depending on the circumstances.

TABLE 22
RELATIVELY INVULNERABLE MISSILES
(Two For One Exchange Rate)

Balance of Terror	Number of Missiles		Other Capabilities
	P	Q	
Near Absolute	10,000	10,000	
Almost Absolute	200	200	
Less Absolute	100	100	
Usually Stable	2,100	1,000	P could have an extra 1,100 missiles
Stable	2,100	1,020	Q has 20 invulnerable missiles
Barely Asymmetric	2,100	1,020	Q has "fallout" protection
Usefully Asymmetric	2,100	1,020	P has evacuation capability
Very Asymmetric	2,100	1,020	P has recuperation capability

The above is the main reason why the balance of terror may be less stable with relatively invulnerable missiles as opposed to absolutely invulnerable missiles. In the last case everyone knows that there is nothing militarily useful to shoot at; in the first case they can delude themselves. Therefore, instead of giving each side 2,000 missiles for the "near absolute" balance of terror (which would give each side 1,000 missiles second strike), we have assumed that each side needs 10,000 missiles pre-attack or 5,000 missiles post-attack for the near absolute balance of terror. However, as always, we must also note that there are only a hundred cities so that in theory 1,000 missiles or even 200 missiles still give each side an absolutely annihilating second strike capability, and that,

for most diplomatic or crisis situations, 100 missiles on a side will be taken as guaranteeing a mutually suicidal war. However, there will be cases in which the lack of absolute totality in the threat, combined with the obsolete military doctrine mentioned earlier, could lead to instability in a particularly tense crisis. There is another reason why the balance of terror would be less stable; an arms race would now be possible. Whichever side may have the productive capability could start manufacturing more missiles; as soon as it had a ratio of more than two to one, it would be in a position to attack. Now reasonably accurate intelligence information becomes important; for without it, one or both sides may feel compelled to procure missiles for fear the other side may achieve a greater than two-to-one advantage. Though both sides have an overkill capability (by a factor of at least ten) in a first strike directed against the other's cities, their second (retaliatory) strike capability may be negligible if the attacker gets enough of an advantage.

In the real world, a potential attacker with a more than two-to-one advantage might still be deterred from attacking. There would be enormous uncertainties and imponderables, and, if anything went wrong, all might be lost. The leaders might also feel that it was immoral to attack without adequate provocation even if they felt certain of a costless win, particularly if its opponent's missiles were located so close to his cities that an attack on the missiles would also destroy cities. Not only would an unprovoked attack by P be immoral, but killing millions of Q's citizens could have many serious political aftereffects. Such aftereffects would probably be especially serious if P got away untouched; for then his likely excuse that the attack was pre-emptive and therefore defensive would not be plausible (even if it were true).

Another reason why 2,100 versus 1,000 is stable is because there isn't any real advantage to striking first. Both sides can take their time about striking, and therefore, in an ambiguous situation, they can wait until any uncertainties are cleared up. It is also worth noting that, just because P has enormous superiority, P's influence will not be absolute. The Soviets have lived under just this kind of U.S. superiority for many years, and their foreign policy has by and large been both confident and aggressive, though prudent. In the reverse circumstances, of course, one would expect the Soviets to press us harder than we pressed them. But it is unlikely that they would have confronted us with an ultimatum of death or total surrender.

One major difference that a 2,100 to 1,000 superiority undoubtedly makes is that, in a very intense crisis, the side with the superiority will not see any particular reason to compromise, while the side with the inferiority may be able to see many reasons. Furthermore, partly because of this expectation and partly because

of a greater objective willingness to escalate, the side with superiority would be more willing to risk a crisis or let one develop. The other side, in its eagerness not to see an intense crisis develop, would tend to be conciliatory very early. Thus the side with military advantage may be able to gain many of its objectives without brandishing its weapons.

Given all of the above caveats, the balance of terror would still be so unstable that P, with 2,100 missiles, might be unsophisticated or immoral enough to attack Q with only 1,000. Let us, therefore, make the situation somewhat more stable by giving Q an additional 20 missiles, but assume these last are completely reliable and invulnerable.⁽³⁸⁾ Now if P fires 2,000 of his 2,100 missiles at Q's 1,020, he will destroy 1,000 of them all right, but Q will still be able to fire back 20 missiles at P. This small fraction of Q's original force would still kill 20% of P's population in a war. In all but the most desperate circumstance P is therefore, likely to be deterred. In fact, about the only situation in which P might be provoked into an attack, would be if Q initiated a limited strategic strike. The deterrence is not symmetrical. P might be willing to use limited strategic retaliation against Q. However, P would still be taking an awful chance though it would be irrational for Q to escalate to all-out war. Q might react emotionally or stupidly with an all-out reprisal. However, most likely he would not. The certainty of a totally destructive reprisal is likely to deter him.

Of course, Q might still have enough resolve to exact a full tit-for-tat retribution. If Q were sufficiently ruthless or resolved he might even try to exact more than just tit-for-tat in his reprisal, but for Q to do this safely requires either some asymmetry in resolve or a rather overly "reasonable" attitude on the part of P. However, it could happen.

In this situation where P has 2,100 two-for-one missiles and Q has 1,000 vulnerable and 20 invulnerable missiles, P has another strategic option. He can conduct a low-level counterforce operation rather than a possible ineffective show of force or an excessively provoking (even if limited) city attack. In these operations against Q's missile force, P would presumably take care to minimize bonus damage. He would then be signaling to Q, "While I am being careful, I am clearly committed. It must be you who backs down. I can afford if necessary to go to the limit. You clearly cannot." Dangerous as this strategy may be for P, it is probably not as dangerous as a limited attack on Q's cities, or even an all-out retaliation. Although P is risking the loss of all of his cities if Q acts irrationally, P might prefer to accept this risk rather than use another strategy which makes almost certain the loss of 20 cities.

Note that it will do Q little good to retaliate with the same kind of limited counterforce attack because he would use up two missiles in attack for every one he destroys, and thus, increase the rate at which his force is diminished. Such a retaliatory attack also increases P's relative military superiority, but this is irrelevant under the assumptions of our simple model.

The low-level controlled counterforce operation is particularly feasible if the missile and city target systems are well separated--if, for example, Q's cities have fallout protection or his missiles are vulnerable to air burst. By making controlled counterforce operations less destructive, simple, inexpensive civil defense programs could make it less likely that there would be an escalation into all-out war or limited city trading. Therefore, if Q procures some modest civil defense, he may decrease his ability to deter P. In fact, in these circumstances P might be tempted to fire 2,000 of his missiles at Q's 1,000 and thus create a situation in which P has 100 missiles and Q has 20 missiles and both sides have 100 undamaged cities. It would then be more possible for P to conduct a controlled reprisal operation against Q and still limit his risk. If worse comes to worst, Q can only destroy 20 of P's cities. Cataclysmic as this would be, it would not be as cataclysmic as P's threat of total annihilation against Q. While Q may still win the "bargaining" (since neither side wishes to lose 20 cities) and P might therefore back down before Q does, still, under most circumstances P should be able to exploit, to some extent, the asymmetry in the threats.

P would have less of an advantage over Q if he were unable to conduct his campaign in a short period of time. Assume, for example, that P can fire only 10 missiles a day. Then P's campaign against Q would take 200 days.⁽³⁹⁾ Any time during that campaign Q could initiate a controlled reprisal against P at, say, a one city a day rate. If Q's controlled reprisal were initiated in the first 100 days, then P would no longer have an advantage over Q; so long as the exchange rate was "equitable," both would run out of cities before either ran out of missiles. If Q were to initiate a campaign of controlled reprisal after 100 days, he would have to do so at a higher level (2 or 3 cities a day) or leave P with a bargaining advantage; at the one city per day rate, it is conceivable that Q would run out of missiles before P ran out of cities and before either of them gave in.

Another complexity can be introduced by giving either P or Q or both, shelter in rural areas to which the city population can be evacuated. Let us assume also that these shelters are so adequate that the evacuees are invulnerable, but that neither P nor Q will be able to recuperate unless at least 10 cities of each survive the war.

Both P and Q would then have a new tactic open to them: they could evacuate. Such an operation is less provocative than a show of force or a limited attack and, at the same time, more menacing. It is not violent in itself, but it could be the prelude to either an all-out attack or a limited one. Neither P nor Q would any longer be risking his people by attacking, only his property. But the situation is not symmetrical; Q's advantages are somewhat illusory. If Q attacks and destroys all of P's cities, P will destroy all of Q's cities in reprisal and Q (also, of course, P) will die a slow death rather than a fast one. Slow or fast, Q will still die, and it will be small consolation to him that P also dies. P, on the contrary, can attack Q and expect to lose only 20 cities in Q's retaliation. However, the situation is not as overwhelmingly one-sided as it might seem; the evacuation is still dangerous to P, for Q may not understand that the loss of his cities will result in an inevitable slow death--indeed, it might take a good deal of analysis to convince him, and there might not be time for that. Of course, P could preempt but this might make inevitable the loss of 20 cities. Even if these cities were empty, P would probably prefer having his own way peacefully to destroying Q and losing 20 empty cities. In a more realistic example, there would also be those chilling uncertainties⁽⁴⁰⁾ to give P pause before he made war inevitable--no matter how reassuring P's paper plans and calculations might be.

The ability to evacuate would make all-out war look more feasible--correctly so to P, misleadingly so to Q. It might also make controlled reprisal against cities more feasible for, even though an evacuation would reduce the value of the cities as hostages and thus remove some of the sanctions against escalation, it would also make the controlled reprisal less provocative since property alone, rather than people and property, would be destroyed. Perhaps even more importantly it would provide a preliminary "moment of truth" for the decision-makers to think much more clearly than they might have before the evacuation about the risks of war and peace as well as about what is vital and what is merely desirable.

A worse situation for Q would occur if P had an evacuation ability, and Q only had fallout protection in his cities. P could then evacuate and be in a very advantageous position to conduct a sanitary, controlled counterforce campaign. It would still be dangerous for P, especially if the counterforce campaign had to be long drawn out, as discussed in one of the previous examples; Q could still threaten a controlled reprisal or an all-out attack on P's cities. This would not only threaten P's standard of living, his cultural heritage and historical landmarks, but, by hypothesis, it would threaten his very survival. P's recuperation depends on at least 10 of his cities surviving the war. Another complication

that would arise in any controlled reprisal against cities would be in "agreeing" on the equitable exchange rate between P's empty cities and Q's populated cities. This complication might be overwhelming.

Finally, it would be well to make the point that, if one side had, say, 10 invulnerable missiles and 10 vulnerable missiles, but the latter were distributed among 10 big cities, so that the attacker had the choice between destroying all but the 10 invulnerable missiles and destroying 10 cities, or all but 20 missiles but no cities, he might in fact prefer the second choice. It is true that in the second case he would be risking the lives of 40 million of his own people, but his chance of post-attack coercion would be greatly increased. In contrast to the first case, where he is only risking 20 million dead, he would be almost guaranteeing this loss.

III. A "Classical" Systems Analysis of Controlled War

A. Problems of Controlled War

Although it would be useful to go on generating simple models, we have probably gone far enough for the purposes of this paper. I have already emphasized that such models are helpful for the purpose of developing language and concepts, clarifying elementary ideas, prodding the imagination, and forcing the reluctant scholar or planner to consider seriously what may seem bizarre and/or even ridiculous. The ideas models illustrate must then be checked for possible application in the real world--systematically, critically, and in detail. This may disclose that what had seemed bizarre and ridiculous really is just that, or as is often the case, examination reveals worthwhile ideas that are simply unfamiliar and strange. Once a decision-maker's horizons have been widened, he may be prepared to consider analogous situations in the real world. Before he can do this, he must consider the details associated with the real world. In this section I would like to consider how one might go about formulating portions of this problem preparatory to doing a systems analysis and operations research on parts which are appropriate. I will use for my example the Controlled Counterforce War.

This example is important in its own right since it is one of the major threats in influencing the development of a crisis or escalation; also while fighting wars this way seems to be U.S. government policy, or close to it, there seems to be relatively little understanding of the requirements, capabilities, or other properties of the Controlled Counterforce War.

TABLE 23

PRELIMINARY SYSTEMS ANALYSIS (DESIGN) OF CONTROLLED COUNTERFORCE WAR

- I. Limitations, Constraints, and Stability
- II. Design, Creation, and Acceptance of Rules
- III. Contingency Analysis (Design)
 - A. Flexibility via alternatives
 1. Hedging against the bad
 2. Being able to exploit the good
 - B. By insensitivity in design
- IV. Cost-effectiveness Analysis
 - A. Dollars vs. targets destroyed
 - B. Additional payoffs and costs
 1. Prewar conflict management
 2. Arms race and stability
 3. Post-attack bargaining

The above table suggests factors we should consider in studying some of the problems associated with a controlled counterforce war in a relatively realistic--but still narrow--context.

First, it is important to understand the relationship among the limitations, constraints, and stability of a Controlled Counterforce War. It is reasonably clear that the more one avoids his opponent's cities--both population and industry--the more likely the opponent is to observe the same limits. However, any avoidance may involve some real military cost. For example, if because a "SAC" base happened to be located in or near Moscow we should refuse to attack it, we would risk retaliation by these spared planes. In the discussion of our simple models and the escalation ladder, I have tried to make clear that (recognizing a great range of possibilities) to determine the proper tactics in a war, we should study the relationships of tactics to how a war begins and how it can best be terminated. Since this is a very illuminating way to evaluate and design tactics for a war situation, it is rather startling that so few have bothered to look at it this way.

It should be understood that we are dealing here with more than a problem of analysis; it is also a problem of design. That is, one can invent tactics which lessen the effects of limitations and which strengthen capabilities, while also making stability more likely. Part and parcel of this quest for stability is the design, creation, and acceptance of "rules" that enhance the likelihood of a successful outcome of a war, or at least avoid a total or mutually disastrous outcome. In some real sense, a controlled war is partially instrumental and partially agonistic. Fortunately or unfortunately, there is no way of creating either norms or shared expectations by experience and precedent. (We do not expect to fight many controlled wars.) One can, however, fight these wars vicariously by suitable passage of documents either deliberately or through public channels (through speeches and other methods of communication). One can even educate the enemy and encourage him to fight wars vicariously. In addition, and possibly most important, on the way up the escalation ladder, decision-makers are likely to have a very educational experience.

Both sides must have enough command and control to enable them to carry out relatively flexible operations and must have monitoring systems which can infer from events, in a reasonable way, what is happening. This is not quite as difficult to do as one might imagine.

Each side can send the other direct messages explaining what it is doing. The other side may not believe the reports, but, unless its information gathering systems pick up contradictory information, it is as likely as not to accept something which is roughly confirmed.

Of course, it might turn out that one side lacks certain capabilities, for example in command and control, to accept the necessary constraints and limitations unless these are made very stark and simple, such as "Go," or "No go." If so, then inducements (and threats) must be available to persuade the other side to live with these constraints.

If a reprisal threat is menacing enough, the decision-maker may be deterred from launching those bombers and missiles which cannot be reprogrammed to appropriate targets. However, this is a rather bleak alternative. A controlled war is much more feasible when the command and control is adequate. This does not mean that each side must have cooperated in advance of a war, since there are many other reasons for introducing flexible command and control systems other than a simple desire to fight a controlled rather than an all-out war. It is also even conceivable that one might offer portions of one's own communication system to the other side in some way; that is, agree to carry and transmit messages.

One may have almost as much trouble with one's own side as with the enemy in gaining acceptance of rules. One can at least attempt to coerce the enemy, but he can only use persuasion on his own side. One may encounter real difficulties if allies must also be persuaded to go along with the notion of controlled and rational response. It is also possible that something may go wrong because of insubordination, unauthorized behavior, miscalculation, or mistakes. Indeed even decision-makers may become emotional or deranged. After all, though we have been emphasizing the "rational" aspects of war, this is not a commercial transaction; this is a war--people are getting killed, property is being destroyed, and so on. Presumably, should this new doctrine be adopted, we would attempt to have the same injunctions against decision-makers' becoming irrational because of emotion as we have today against cowardice because of fear, recognizing, of course, that in either case the injunctions may fail.

However, it is clear that there may be doctrinal lags, and that either side may interpret actions inappropriately at least from the opponent's point of view.⁽⁴¹⁾ We are considering a controlled war, where nuclear weapons may be used discriminatingly--partly to achieve destruction and partly to demonstrate the possibility of additional dramatic and destructive acts. Each side is trying to convince the other side that he should consider, or reconsider, the consequences of his next "move" and accept a reasonable "compromise."

It is important in all such studies of command and control, as well as of other aspects, that proper attention be paid to contingency analysis or design. The most important part of contingency analysis is to have sufficient flexibility to cover a very wide range of circumstances. There are two basic ways to achieve flexibility. One is

to be prepared with many alternatives so that, as information comes in and situations develop, one can initiate actions which hedge against "the bad" or exploit "the good." Command and control is clearly the first requirement of such a capability, though many other things will be needed. Another way to achieve flexibility is to have insensitivity to events designed into the system so that, even without having any alternatives, the system itself will have hedges against the bad and be able to exploit the good.

In trying to see what changes need to be made in our current system of command and control, we must do at least three kinds of studies. In the first study (which is the one most likely to be done), one basically maintains previous standards of efficiency, competency, and operations, and then asks how much flexibility can be assimilated or absorbed into the old system. The likely answer is, "Not too much." In the second kind of study, one insists on getting a certain minimum degree of flexibility and asks how much the operation is degraded, assuming that we have this flexibility. As I mentioned earlier, this may mean that some of the bombers and missiles are either left unlaunched or launched from the narrow military point of view, in a very inefficient fashion. (This, however, may be the most efficient possible fashion from the viewpoint of improving the outcome of the war.) Finally, of course, one wishes to do a more adequate study for future systems of the complete trade-off between limitations, constraints, and stability over time, including sophisticated cost-effectiveness calculations as discussed below.

B. The Payoff Function (Post-attack Bargaining)

Perhaps the most important consideration in controlled war is the cost-effectiveness analysis. Classically, this is done by looking at the number of dollars invested in the system compared with the number of targets the system would destroy in various circumstances. This analysis must still be done, but in addition it must include a much more complicated and important analysis with new kinds of payoffs and costs.

Instead of defining effectiveness only by counting the number of targets one's missiles might destroy, we now define effectiveness in terms of improvement in one's bargaining position. This improvement is measured both before and after an attack has started, and therefore includes one's ability to "manage" the cold-war conflict before the attack. The multiple "costs" that are now considered include such items as: effect on the arms race, stability of the balance of terror, value of the force in solidifying an alliance or affecting the attitudes of neutrals, effects on values of being prepared to fight a war as well as deter it, and so on.

All of these things are very difficult to analyze. I will concentrate my attention here on how one measures the improvement in one's bargaining position. Both in reading reports and talking to analysts, we have noticed some understanding of costs in terms of arms race, possible destabilization, public "image" problems, and so forth, but much less understanding--both conceptually and practically--of the idea of analyzing the payoff in terms of the improvement in one's bargaining position.

To further illustrate the point, let us consider briefly some of the dynamic factors that would have to go into substantive studies. In any particular instance--pre-attack or post-attack--each side has a certain threat capability; that is, it can do a certain amount of counterforce damage and a certain amount of countervalue damage or varying combinations of these. (More counterforce damage will tend to mean less countervalue damage and vice versa.) Furthermore, the notion of damage is complex. For example, in a counterforce attack by the United States against the Soviet Union as one of our objectives might be Soviet advance bases in the northern part of the country, with the hope of frustrating immediate Soviet plans by making it temporarily difficult or impossible for Soviet short-range medium bombers to use these bases for refueling. But this frustration may not be absolute. The Soviet Air Force could probably regroup, improvise, use aerial refueling, and otherwise recuperate its capability. A somewhat greater degree of damage, in the first strike or in subsequent waves, might hinder or permanently prevent this improvisation. Damage to command and control is obviously a critical factor and yet hard to evaluate. Insofar as there are weapon carriers which are not destroyed (e.g., Polaris submarines, very hard missile sites, and mobile missiles) and which do not need coordination in attacking, the major effect of destroying or degrading command and control would be a delay of the eventual order to fire, elimination of possible efficiencies available through retargeting, and added opportunity to coerce or intimidate the enemy, but the threat still looms. For bombers some minimum command and control may be essential to provide coordination. Thus the concept of damage is a dynamic rather than a static concept: it can increase or decrease over time, by deterioration or recuperation.

When it comes to countervalue damage, the nation's decision-makers and their bargaining position will be affected by the amount of damage that has already been done as measured by the number of people killed, the amount of property destroyed (whether this property has sentimental, cultural, or any other special values), and how badly the environment has already been affected. In most circumstances, the nation's leaders will be even more concerned with the enemy's threat, the people who may be killed, possible further potential reductions in the immediate post-war standard of living, and further degradation in the eventual capability to recuperate or

the speed with which this recuperation can be carried out. The bargaining may also be affected if some portion of the country is considered to be relatively invulnerable. The decision-makers might be much affected by their estimate of what would be left in a last-ditch extremity: what is the ultimate threat the enemy can pose at any particular point? Finally, there are the physical and political capabilities for command and control. The actual bargaining will be much affected by the state of information about both sides, such as each side's estimate of the other side's estimate, and vice versa, such estimates to include the effects of attempts to bluff and otherwise mislead.

Each side is likely to attack morale or resolve in addition to inflicting physical damage. In trying to achieve some sort of bargain, resolve may be more vulnerable than weapons. Attacks against resolve could use communication, persuasion techniques, misinformation, sabotage, espionage, and tactics designed to frighten and deter while minimizing provocation that might lead to the 'wrong' kind of emotional or irrational acts. Or one might want so much to maximize apprehension that worries about provocation would be secondary.

As a hypothetical example, imagine that one's opponent spares the ten largest cities on one's side while destroying as many of the other cities as he is capable of hitting. If successful, the side with only ten cities surviving might easily be intimidated by the prospect of losing the remainder. Having lost so much, it might feel, possibly correctly, that these last assets--the largest ten cities--would be essential to its recuperation. It might also be crystal clear that the opponent has more than enough capability left to destroy these last ten cities. The opponent, by creating this situation in which all of one's remaining eggs are in a small number of baskets, might actually have a stronger bargaining position than he would have had, had he concentrated on destroying strategic forces and ignored cities. In other words, the importance of the assets visualized as being at risk as compared to the assets not at risk greatly influences the effectiveness of the enemy's threats.

Bargaining against the background of controlled reprisal is likely to be very simple, mostly in the form of "take it or leave it." There are, however, roughly six distinguishable classes of peace offers which we might make in a controlled war: (1) an unconditional surrender by the enemy, (2) concession of defeat by the enemy with acceptance of specific surrender terms and guarantees, (3) a cease fire under current conditions, (4) a cease fire with a return to pre-war status quo, (5) a situation in which we concede defeat but demand guarantees and terms before agreeing to a cease fire, and (6) an unconditional surrender on our part.

One would not necessarily try to conduct such negotiations with the prewar government; one might try to divide the enemy, e.g., to negotiate with the military authorities or with some other powerful group. Exactly what might be done depends considerably on the timing and the prewar situation. This last may be particularly crucial. The way the prewar crisis started and developed into a war could make a great difference. For example, in the many moments of truth encountered on the way up, the prewar escalations and war plans may be re-examined and changed; in any case, decision-makers are likely to be exposed to a lot of strategic education while military leaders may have important and surprising constraints imposed on their plans.

All such bargaining, at the upper as well as at the lower rungs of the escalation ladder, is bound to be complicated by the fact that each side's information will be different; each side will be attempting to bluff the other side, to give misleading information; there will be communication difficulties; there will be the pressure of time; there will be the disturbing effect of emotions, irrationality, anger, miscalculation, bad doctrine, misapprehension, mistakes, and the like. At the upper end of an escalation ladder, some of these effects are likely to be greatly intensified.

This kind of analysis is a complicated and difficult thing to do; in fact it cannot be done with any precision or objectivity. But the attempt must be made. No one should engage in a thermonuclear war to discharge hostilities, to be malevolent, or to gain a kind of glory--war is just too destructive and serious for that. One fights war today to achieve objectives. Indeed, today war is a bad way to achieve any objectives except under circumstances that leave no alternative. Such situations may arise, however. If they do, the objectives of war are likely to be best achieved by some kind of agreement to a cease-fire long before either side has exhausted its weapons or been totally destroyed.

The elements of bargaining during war are shown in Table 24.

TABLE 24

BARGAINING BETWEEN P and Q

- I. P's Current and Future Threat Against Q's:
 1. People
 2. Recuperation
 3. 'Wealth'
 4. Countervalue capability
 5. Counterforce capability
- II. Q's Current and Future Threat Against P
- III. The Promises Each Country Can Make to the Other:
 1. Value
 2. Credibility
- IV. P's Resolve vs. Q's Resolve:
 1. Expectations, attitudes, and morale
 2. Current "emotional" and objective state
 3. Strategy, tactics, and "technical" capabilities

The table can actually apply both to peace and war situations, but we will consider it here in the context of a war. The first thing one must consider in bargaining between two countries is the kinds of threats they can make against each other, currently and in the future. Such threats may be against the opponent's people, his immediate postwar standard of living, or his power of recuperation.

It is important to note that one can destroy existing wealth without necessarily undermining recuperative ability. (For example one can destroy many buildings which may not be critically important to the recuperation process, but which may be very important to one's comfort during recuperation.)

The complexity of recuperation has already been indicated in connection with Table 3. The "wealth" notion has to do with one's standard of living while one is recuperating. For example, even if the U.S. and the Soviet Union had a perfect civil defense program, i.e., one reliably protecting every single inhabitant and all productive facilities needed to recuperate after all the cities had been destroyed, both sides would still be deterred from risking war in most circumstances. They simply would be reluctant to lose these cities with their enormous historical, sentimental, and cultural

values which have been so painfully constructed over centuries. (And furthermore, who would believe calculations promising full protection and guaranteed recuperation?)

In classical wars, for example, it was rare indeed that a retreating side would apply the scorched-earth policy. It was hoped that the tide might change and the lost territory could be reoccupied. Most people have an enormous attachment to their material possessions. The prospect of replacement, in some sense, after ten years is scant consolation. A determined people, however, whose vital interests are clearly at stake might be willing to lose their luxuries, particularly if they do not have very many.

To thoroughly consider all five variables related to one country's threat against the other is complicated because the threat itself is a complex quantity. It is possible for example, that if one side concentrates on the counterforce objective, its countervalue ability goes down, and vice versa. It is also clear that bargaining involves more than merely the objective threats. An important factor, therefore, is a question of resolve. Which one is willing to run the greatest risk, to accept the greatest damage, to be the most stubborn or courageous?

This contest of resolves will be affected by the expectations either side has of the outcome of the war, and, in a way, of the role of the war in the future history of the world. If one side feels that the other is very likely to back down, and the other side strongly doubts that the opponent will give ground, then the pressure on the second side to back down is indeed great.

The actual strategy, tactics and technical capabilities expressed through communication, planning, and control are complicated but may appear more complicated than they really are. Consider, for example, a homely example of two men bargaining over a house. Anyone with experience in selling a house knows how crucial the potential buyer's estimate of the seller's rock bottom price can be, and how this is related to the seller's estimate of the buyer's estimate. The bargaining involves the buyer's estimate of the seller's estimate of the buyer's estimate, and so on. This sounds like a complicated thing, but actually people in this situation intuitively carry all these variables and many others in mind without much difficulty. This may not be as true for the decision-makers in a complicated, dangerous, frightening, and emotional wartime situation, but, if it is not, it will be partly because the decision-maker has not been sufficiently trained or has not gone fully enough into ersatz experience.

We are interested not only in P's current threat but in his future threat. That is, what will happen to these threats over time as Q attacks P's forces. If P has some minimum capability which Q cannot attack or destroy, this will improve P's bargaining ability.

C. Comparison of Two Systems

I would like now to contrast and compare two admittedly oversimplified strategic systems. Doing so will expose more of the issues which have to be studied. These two systems are described in Table 25.

The first one I will call finite deterrence plus limited strategic retaliation. The particular finite deterrence posture I want to consider might consist of an adequate number of relatively invulnerable missiles, posed for attack against a pre-assigned and fixed set of countervalue targets. This attack would be triggered, perhaps automatically, by a large attack on the United States. There would be absolutely no attempt to alleviate the consequences of the war. There would be a small number of flexible missiles for use in a limited strategic retaliation, but the rest of the system would be "cast in concrete." Such a system would assure the other side that one would actually press the buttons only as a very last resort. With this system, one would try to use limited strategic retaliation to force the other side to limit its provocations. On the other hand, this system would seem to provide the maximum deterrence against surprise attack, since there would be few ways to coerce or intimidate our response. We have only a single button and our only alternative is to push or not to push the button for the bulk of the force.

The second system would have a counterforce capability. This would require not only a capability to destroy or at least damage or degrade the other side's offensive system but also some active military defense and some civil defense. The civil defense might include capability for evacuation so that one could put most of one's civilians in a place of relative safety upon some reasonable notice such as 48 or 96 hours. With such a force one might conceivably prefer to go to war, rather than acquiesce on some vital issue. Here "vital" actually means of such great importance that our way of life is threatened and not simply "important." It probably only includes provocations involving major violence by the other side to us or to our allies. Assume now that the systems analysis of each system has been carried through and we wish to choose between them.

Let us compare the two systems identified respectively as FD and CF. In terms of strategic doctrine and procurement, FD is simple, perhaps deceptively simple. It might consist, for example, of 500 or 1,000 missiles protected by being very mobile or very hard, a simple go-ahead order for the command and control, plus a small number of flexible missiles that can be retargeted and otherwise controlled for use in limited strategic retaliation. The CF system on the other hand must be complicated. It should be able to survive as an operational entity any kind of attack that the other side can launch, including multiple waves. It should be able to seek out, with some

TABLE 25
TWO KINDS OF CONTROLLED WAR SYSTEMS

	Finite Deterrence Plus Controlled Reprisal	Counterforce and Not Incredible First Strike
Military Systems	Simple	Complex
Technical Feasibility	High? —	Medium to Low?
Political Feasibility	Medium to Low	Medium to High
Arms Race (Immediate Effect)	Slowed Down	Continuation or Moderate Acceleration
U. S. Image	Peaceful (if unexplained)	Potentially Aggressive
Domestic Policy	Difficult if C.F. Policy Is Explained	Acceptable
Capability of Detering Surprise Attack	High	High
Stability Against "Reciprocal Fear of Surprise Attack"	High	Medium But Probably Satisfactory
Alliance Problems	More?	Less?
Capability Against "Hitlers"	Low	Medium to High
After-Effects if No Escalation	Minimum Damage (Arms Race More Likely than Detente)	Relatively Moderate Damage- Likely Detente or Settlement
After-Effects with Escalation	Total Destruction	Limited Destruction

accuracy, the other side's strategic forces, and, if these forces are mobile, possibly try to get them by area attacks, or the use of limited intelligence plus large yield weapons, or possibly by attacking command and control.

The counterforce capability must be either large enough or efficient enough so that its use improves one's relative military threat. This may require either the identification of enemy weak spots and leverage targets or the use of weapons systems that can destroy many targets cheaply--perhaps manned carriers with many air-ground missiles and with some ability to perform reconnaissance and improvise attacks at hidden or even fleeting targets. Another useful possibility would be missile installations which can reload rapidly and thus reduce the cost of each missile firing by having the cost of the fixed installations amortized over multiple firings. An adequate counterforce capability could also require complicated reconnaissance, surveillance, intelligence, data processing, and monitoring systems. Command and control may have to be incredibly complicated, possibly so complicated as to be a limiting factor. One would need the ability to bargain, withhold, negotiate, retarget, reprogram, estimate the damage to one's self, estimate the damage to one's enemy, re-evaluate old contingency plans and draw up new ones, and so on. CF will require the maintenance of complicated active and passive defense systems and some estimates of how they might perform under varying circumstances, with allowances for the inevitable uncertainties. Because of this complexity, the CF system may not even be technically feasible in the indefinite future, certainly not if one regards its feasibility as an either/or proposition rather than as one of degree.

CF has other problems aside from feasibility. It would appear relatively aggressive, compared with the FD system, since it envisages a first strike in some circumstances. Although this would be a strike in reprisal for some extreme provocation, the CF system still involves a complexity of analyses and value judgments that the FD supporters do not have to cope with or at least think they do not.

While a symmetrical CF is not as unstable as many of the theorists imply (it is much like the multistable deterrent, already discussed, with deterrence against both an attack upon the United States and extreme provocation), it does raise such problems as "reciprocal fear of surprise attack" and "anticipatory retaliation."

Probably even more important, the CF system encourages at least a limited arms race. Here again one can over-emphasize this problem. The arms race is of greater significance to the CF than to the FD system because in the former case neither side may be willing to allow his opponent to have a second-strike overkill capability. If neither side has an overkill capability, then greater efforts in both offense and defense could pay off, i.e., there would be an offense-defense

arms race. On the other hand, these are all questions of degree rather than of kind. Both sides probably would have adequate deterrence for the situations they really envisage as happening; neither side assumes that the strategic systems will actually be used; both sides have bought them more as a contingent possibility. Each side knows that if it increases its capability, the other side is likely to react and thus negate the increase. This expectation has in practice actually acted as a deterrent against increases.

Finally, if our allies consider the FD system inadequate protection they may be encouraged to procure their own systems and thus accelerate the arms race.

The major arguments for a CF system are given by the last four entries in the chart--the very last entry probably being the most important. Despite all precautions, war can still occur, and it is better to survive a war than not. Therefore, one needs to have systems which can reduce the damage done in a war. Such reduction requires a system which can destroy enemy systems on the ground or in the air, negate their effects through civil defense, and so on. A second argument which can be used both for and against CF is that it would lower the threshold of provocation for a strike by the United States against the Soviet Union. There are two questions which must be raised about this lowering: Is it desirable? Is it feasible?

As for the desirability of such a lowering, it seems to this author to be of some importance to have a credible alternative to peace or at least an alternative to certain kinds of peace. In today's world, the "peace at any price" position is likely to be much too dangerous, leading in the short run to excessive accommodation, and in the long run to all-out war. It is very unlikely to bring about a peace we can live with over a long period. As to the feasibility, it seems clear that there will be some circumstances under which a change in the probabilities of different expectations may change the decision-maker's choices. He cannot be certain that any attempted controlled war will work, but he cannot be certain that it will not work either. It is of course possible that the decision-maker will ignore probabilities and concentrate on the best or the worst that can come, depending on whether he is optimistic or pessimistic--or more likely, desperate or reasonably satisfied. But I would rather suspect this to be too crude an approximation of likely behavior. His estimate of the probabilities of various outcomes is quite likely to influence his decision.

I should probably now repeat that the comparison in this paper is artificial and is being made for methodological and pedagogical reasons; the real policy choices are likely to be between a modified FD system with some flexibility and active and passive defense, and a CF system which keeps open, until the last minute, the options of

limited strategic retaliation or some high level of controlled counterforce. However, if the artificial choice really should be the policy choice, I believe that a persuasive argument can be made for CF over FD--at least for the next five or ten years. In addition to the points already made on the need for a capability to survive wars, the CF system has a basically greater capability against Hitlers. Moreover, it makes some attempt to cope with the problem of accidental and other wars. Furthermore, since the aftereffects of at least a successfully controlled war may be better than the aftereffects of a controlled reprisal (winning or stalemating and in some circumstances, even a defeat, are quite likely to have better results than the naked matching of will against will in controlled reprisal), the CF system seems to be better in the long run. Lastly, all-in-all only the CF system really seems to meet the requirements for the leader of a world-wide alliance. Other systems are likely to result in the fragmentation of the alliance because of differing risks. The U.S. might either find it untenable to accept a limited strategic reprisal for the sake of our allies or might be willing to accept the sacrifices of our allies' cities as long as ours were not damaged. The differential risk could cause our allies to seek other methods for their protection which in the long run might both accelerate the arms race and be unsatisfactory protection.

It should be clear that it is fruitless to discuss abstractly the realistic problems and possibilities. The specific details and contexts are so important that they dominate the choices. There are two difficulties in discussing such details and contexts. The first and most important difficulty is that relatively little work has been done--in many cases we do not know how the details should affect our choices. Secondly, some details involve classified information. Therefore, all I have tried to do here is indicate the kind of issues and items which we must study in order to think through the appropriate choices for our strategic forces or even to shed light on some of the major issues which should influence these choices.

D. Special Situations

Difficult as it would be to make the above comparison well, it would in no sense finish our job if we are really trying to make a serious recommendation on the choice between FD and CF. Before we can do that, we have to examine other situations than the one envisaged in the comparisons for a U.S. - S.U. war. That is, we would have to look at second, third, fourth, fifth and even tenth priority missions for the strategic forces.

Whenever one discusses Nth priority missions, rather than first priority missions, there is a certain tendency to do it in a somewhat frivolous way. By this I mean that the discussions are polemical;

lower priority objectives are added as an extra justification for something one wanted to do anyway; one may not be certain that his arguments for the first priority objective were convincing, so he adds some extra objectives and hopes that these will carry the day--or at least confuse the critics. But the polemicist does not allow the verbal addition of these secondary objectives to compromise the design for the primary objective. If one really wants to look serious about an Nth priority mission called X, one needs to do more than just to mention X.

TABLE 26

HOW TO LOOK SERIOUS ABOUT X

1. Mention X
2. Say X is serious
3. Have a chart on X
4. Have calculations on X
5. Devote time, energy, and space to X
6. Let X affect the study
7. Be serious about X

One could say that X is serious. This is not very impressive either. He could have a chart illustrating why X is important. Such a chart takes at least an hour of thought, so that audience knows that someone at least spent time on the idea. That could give some assurance that X was worth attention. One could go so far as to have calculations on X. That really means that someone took it at least modestly seriously. Now, of course, he could really be serious--he could devote time, energy, and space to X. Most important, he could let X actually affect the system. He could compromise the design to exploit the fact that X is an important objective or circumstance. And then you know he's serious. I know of very few cases where this has happened. Let me give examples.

Almost everybody is willing to believe that, if the Soviets are very, very intelligent and work very, very hard, they can design missiles and penetration aids that will surmount almost any reasonable AICBM program. However, most people also believe that the Chinese, who are likely to have a much smaller threat and also be at least five years behind the Soviet technology, will not accomplish the same program with the same ease. Therefore, a system designed against the Chinese might well work. Many people who are trying to push AICBM systems have noticed this and suggested that at least we should procure a system against the Chinese. But I have never seen a calculation of how such a system would work against the

Chinese--or even a chart illustrating the point, much less a compromise of a design.

Or to take another example. Back in the middle and late fifties I was advocating underground SAGE headquarters. And one of my arguments for this was that even though you might not believe in air defense, you must believe in flexible and invulnerable command and control. The SAGE headquarters looks very much like any kind of generalized command and control headquarters. It has communications, display equipment, and trained people, and it might be a very useful thing for us if we had holes under the ground, filled with the right kinds of equipment, in the early sixties. I argued that we wouldn't have this unless we began immediately and that this was a good enough justification for putting these facilities deep underground rather than building them aboveground as we were doing then. The argument is in fact quite convincing, but, as far as I know, nobody spent 10 minutes asking how SAGE operated as a command and control headquarters, whether its location was geographically right, whether the equipment was really right, etc.

Let me amplify what it means to take secondary and tertiary objectives seriously. I can illustrate the basic point with a story about the internal revenue collector's office in the New York City area. At one point, the office ran out of their first notices for delinquent payments in income tax, so the local clerks simply sent out second notices. They found to their surprise that the rate of response was something like two or three times the rate of response to first notices, so the head of the office decided to save the government money and postage by sending out only second notices. When Washington heard about this inflation of the government form, top officials put a quick stop to it.

I want to call this the "second notice effect," and I'd like to point out the following bureaucratic analogy: often when I go around the country visiting various installations I ask, "Do you take so-and-so seriously?" And they say, "Why absolutely, we do!" And I say, "Well, how come it has had no effect on the design of the system?" They say, "Well, we asked," and they show me a letter in the file, "but we got turned down by those fools in Washington!" I then ask, "Since first letters are automatically turned down, where is your second letter? How can they tell whether you really wanted it or not until they hear you scream?" There is, of course, rarely a second letter in the files, and both they and I know that their first and only letter was a truly pro forma move. Of course, if my notion becomes widely known, nothing will happen short of a third letter.

It should be clear that no one has the right to expect others to accept an argument he hasn't yet taken very seriously himself. Taking an argument seriously means second letters, calculations,

charts, compromise of designs which rarely exist for any second-priority objective. From the viewpoint of the national interest in having 10th priority objectives taken seriously, it is sometimes useful to design a system around a low priority objective. Demonstrate that even though the objective is low priority, it is important enough to justify the cost of the system, then point out that this same system, slightly modified, will have some capability in achieving the highest priority objective. The better methodology would, of course, consider all the priorities simultaneously and design the system to handle a complete range of contingencies and objectives. But actually, people are so unused to thinking seriously about a low priority objective that a deliberate attempt to emphasize it by resting one's case on it attracts real attention.

With this in mind, consider some relatively low priority situations that are often slighted. Let us focus on eight situations in which an ability to fight, survive, and terminate a war is likely to be especially useful or feasible for us or for the Soviet Union. These are listed below:

TABLE 27

SPECIAL 'WAR SURVIVING' SITUATIONS

1. "Arms Control"
2. Rise of a Hitler
3. Other Controlled Wars
4. Inadvertent Wars
5. Favorable Military Circumstances
6. China
7. Other "small" Countries
8. Technological Breakthrough

I do not mean to imply that it would be sensible for either the U.S. or the S.U. to attack the other in any of these situations. I merely wish to point out that the possibility of surviving a war might be enhanced or be more important in these situations than in the spasm war situation usually envisaged. In most of these situations, the desirability of having some war-surviving capability will hold even if both the Soviet Union and the United States have weapons systems which potentially can, in an all-out countervalue spasm, overkill the other's country several times. So long as human beings control the buttons, an all-out spasm war is not inevitable. Thus, we might still be interested in war plans and capabilities which could be used to fight, survive, and terminate other kinds of wars in addition to deterring them.

Some of the situations on Table 27 are at least as likely as a deliberate surprise attack directed mostly at civilians. In view of this, it is surprising that so many laymen and some experts direct all their attention and discussion solely to one kind of war. In any case, even if some of the eight situations were less likely than a spasm war, they would be likely enough to necessitate taking them into account when designing programs. Indeed, in theory, any one of the eight situations might justify a special program tailored to that situation if there were no other way to handle the eventuality. Fortunately, most of the components of a properly designed military establishment can be valuable in a wide range of situations. It is important, however, that the special situation be taken seriously and allowed to influence the program instead of being merely used as an argument to justify an existing program which has been neither compromised nor redesigned with that situation in mind. Let us take up the eight situations briefly in turn.

1. "Arms Control." Naively, one might believe both sides were now building all the horrible devices possible, including the most spectacular, the doomsday machine. A doomsday machine would indeed render obsolete many suggested defense programs. But so far as I know, we are not building doomsday machines and neither is anyone else. There are other militarily potent systems--short of the doomsday machine--which could be but are not being built simply because they are very expensive or specialized in use, or because nobody wants to own them. The present reality of, and the possibility of, encouraging further appropriate unilateral arms control measures must be taken into account in judging the potential long-term performance of any defense system.

It must also be realized that even elaborate agreements with the Soviets and others would not mean that war cannot happen. Barring an effective world government (and even with one, under some circumstances), we will have need of an effective military force to defend our country. Agreements may be deliberately broken, they may be abrogated, or they may be accidentally violated.

Almost any degree of truly effective arms limitations lessens the problems which could be intolerable if there were a full-fledged arms race. If "survive the war" defense programs are compatible with arms control measures (and in many instances defense and arms control measures may work better together than separately), then such defense measures, including current long-range development programs, should be evaluated with arms control in mind. In other cases, given military defense measures and arms limitations may conflict to some extent. If the measure does little damage to arms control and if its military value is great, the military measure may be worth retaining. But if the military value is small and incompatible with controlling the arms race, we might well want to avoid the measure, even unilaterally if necessary. Each case must, of course, be evaluated on its merits.

Barring extensive arms control, it is almost inevitable that countries other than Russia and China will obtain significant strategic capabilities. Therefore, we may still be in the business of defending ourselves against others, whether or not we can defend ourselves against the Soviets or even the Chinese.

2. Rise of a Hitler. The next and, I hope, the least likely contingency is the rise of another Hitler. But, however unlikely it may be, it is still very important. Unlike the other categories where fighting and surviving a war might be especially feasible, in this situation it may be essential just to be able to do as well as we can regardless of the feasibility. It is commonplace today to say that Khrushchev is not like Hitler; he does not seem to be as reckless. He is not as determined, not as malevolent.

Some, most notably A.J.P. Taylor, have even said that Hitler was not like Hitler, that further appeasement would have prevented World War II without German domination of Europe and perhaps the world. Doubtless Hitler and his government were relatively cautious in the period 1933-1943, compared to the usual image of his methods. He acted more rationally and prudently than most of us recall, and, in fact, came uncomfortably close to achieving his objectives. But even then he was an incredible threat to his war-weary, peace-loving opposition.

Today, a Hitler--the stereotype--who is reckless, absolutely determined, crazy or realistically simulating madness, would have an important negotiating edge. If somebody says, "One of us has to be reasonable and it is not going to be me, so it has to be you," he has a very effective bargaining advantage, particularly if he is armed with thermonuclear bombs. If he can convince you he is stark, staring mad, and if he has enough destructive power, you will also be persuaded that deterrence alone will not work. You must then give in or accept the possibility of being annihilated.

Moreover, no matter what treatment you could expect at his hands if you surrendered, there would always be some who are prepared to persuade you that fighting him would be worse.

It is difficult for Khrushchev to convince us that he is stark, staring mad because we can see he is thinking rationally about some things. It may happen that a leader will take over somewhere, sometime, who either is mad or who convincingly acts the role of a madman. We could check him only by being able to put our people in a place of relative safety so we could say, "Look, if you really are insane, we will fight it out." If somebody says, "I would rather be Red than dead," while still part of a "fighting unit," he is presumably a coward or at least cautious, and, depending on the circumstances, may properly be an object of contempt and scorn. But if somebody says,

"I would rather have everybody Red than everybody dead," he is taking a reasonable position with which I agree--although there are some who would not.

While I would rather have everybody Red than dead, we must not allow a situation to develop in which such a choice is the only one we have. If we may have to deal with a "madman" or even a reckless blackmailer, we must always have the ability to say, "The survival of our people and the human race is not the question. Our nation and our system can survive the worst you can do, and we are prepared to accept many casualties rather than surrender."

3. Other Controlled Wars. There are, of course, many kinds of controlled wars other than the ones we have discussed. Some of them may allow for a great deal of post-attack mobilization and/or post-declaration mobilization, and in these cases it can be very important to have a base on which the mobilization could build. Such a situation could occur, for example, after a formal declaration of war. Or there could be an escalation and then a de-escalation which would touch off a mobilization. Or there could be a controlled war which gradually escalates. If one has no other possibility than pressing all the buttons or temporizing, one may well prefer temporizing.

4. Inadvertent Wars. It may be especially important to make plans for fighting, surviving, and terminating inadvertent nuclear war. Such contingency plans may turn out to be especially feasible. A war begun as the result of accident, error, miscalculation, unauthorized behavior, and so on, might be much more destructive than a calculated war precisely because it is more likely to be uncontrolled; it might also be less destructive because planning or tactics may be poor and forces unready and badly positioned (for example, few submarines in range of planned targets). Before cataclysmic damage had been done, both sides might be especially willing to call off such a war and return to some version of the status quo. We must be flexible enough to handle this contingency both to minimize danger from the weapons that explode and to maintain sufficient control over our forces so that such a war could be stopped quickly.

5. Especially Favorable Military Circumstances. Although the possibility is almost always ignored, even an all-out war might reveal materially favorable or unfavorable military circumstances. To illustrate the conceivable circumstances, consider these examples:

Although radar warning of missile attack can theoretically be reduced almost to zero, we might be warned by other means. A limited war might begin in Europe, and, worse, it might seem to be getting out of control. At such a time, I assume, we would be more than willing to evacuate our cities, and, in fact, probably could not stop the evacuation. People would leave the cities, and the only

question would be: Is the evacuation reasonable or unreasonable? Effective or ineffective? Is the population being evacuated to places of protection and safety, or to overcrowded, vulnerable, or otherwise dangerous facilities?

Such an evacuation might take place over a period of days, weeks, or even months, not as an attempt to outrun the ballistic missile, but as a strategic evacuation after an adequate warning, supplied not by an intelligence agency, but by the local newspaper. The events that caused the war might also give us adequate warning and allow us greatly to diminish the casualties from a war.

Our opponent might fail to procure or have fully operational the forces we thought he would have. Recent history has given us several examples of almost unpredictable weaknesses materializing in the Soviet system (for example, weakness or lagging in: air defense, ground-launched decoys, aerial refueling, susceptibility to U-2 reconnaissance, long-range bomber procurement, intercontinental missile procurement, and so on). (42)

Either we or our enemy might be militarily superior and not know it. For instance, during the Korean War our fighters had a number of aerial combat duels with fighters of the other side. It has been claimed, and there is no reason to doubt it, that for every one of our planes they shot down, we shot down sixteen of theirs. If I had been discussing fighter duels in 1949, I would not have had the nerve to so much as conjecture that we might be sixteen times more potent than the other side. I would not have had the nerve to suggest, even as a hedge, a program that would work well if we happened to be sixteen times more potent than the other side.

Things like this do occur. When they do, it can substantially change the effect of a war. Positioning oneself to exploit a favorable possibility but not relying on this possibility is very different from the wishful thinking that assumes the favorable possibility will necessarily occur.

6. and 7. Chinese and Small Country Attacks. The possibility of a Chinese or smaller country attack is fourth priority but still very important to consider and guard against. Most readers will be willing to believe that by the late 1960s or the early 1970s the Chinese will probably have an effective strategic nuclear capability. But, unless we are careless, it is unlikely that they will be able to launch a surprise attack on us good enough to prevent a massive retaliation sufficient to deter them from attacking. However, the Chinese system may be good enough to give nuclear deterrence the character of a two-way street. If we wish to be protected against threats by the Chinese, or even a controlled reprisal initiated by them, we need both a defensive and an offensive capability that will be quite effective.

In view of the fact that Chinese technology seems at least as far behind Soviet technology as NATO technology is behind that of the U.S. (from three to ten years), the possibilities of such capabilities are not academic. Since a system designed especially to take advantage of Chinese weaknesses might be totally ineffective against the Soviets, we have to consciously design and prepare for this possibility. It will not be an automatic by-product of our preparations against the Soviets. If the capabilities are to be in place and reliably working in the late sixties, it is not too early to start working on them now or to consider modifying existing programs.

8. Technological Breakthrough. Most technical specialists feel that developments in technology, even some startling development which might be characterized as a "technological breakthrough", will hurt more than help active and passive defense measures and other chances of surviving a nuclear war. But this gloomy probability is not inevitable. For example, all of the various possibilities for defense seem today to have serious defects. However, the measures have not been fully explored and their defects may not be so serious as is believed by those who completely discount active defense. Although the vigorous use of countermeasures by an attacker would enable him to degrade all systems known today, we may be able to develop significant levels of active defense against both planes and missiles. Moreover, even degraded active defense combined with appropriate civil defense measures could make a large difference in our ability to survive.

The United States is working hard at developing and testing various defense systems. Not all the possible improvements which might emerge from this work are predictable. If significant improvements occur, we should be in a position to take advantage of them, but we cannot take advantage of such improvements unless we have started the necessary associated programs.

IV. Coping with the Real Future

A. Early Sixties

Consider now the real world and its future. We started this chapter with a discussion of the arms race. We then tried to define certain concepts and vocabulary and to give some orientation by examining a few simple abstract models and extreme scenarios. We have just finished a more realistic treatment of a controlled central war by what could be called the classical methods of systems analysis and operations research. Setting all this to one side, let us now take another tack and start afresh by asking, "What are the real problems of national security and international order?"

In tackling this question, we should, in principle, describe the present and future environment as best we can, then describe or enumerate our objectives, and then design and investigate capabilities and invent tactics using feasible capabilities to achieve our objectives in that environment. This is, of course, a very complicated process and one which cannot be carried through. But the attempt to do so is very valuable. I will at this point comment very briefly on how one might go about this program. One can accomplish enough to provide a great deal of orientation, stimulation and provocation, and can facilitate communication, coordination and integration, and provide a context for detailed studies. Let us therefore start with the environment of the early 1960s.

This is outlined in Table 28 which contains mostly familiar items. We still live in a bi-polar world, but in both the West and the East there are trends toward a growing polycentrism.

TABLE 28

THE EARLY SIXTIES

Political:

Mostly bi-polar world - some polycentrism
European nation-state system passing
Non-European Nationalism
Western Colonialism liquidated
Revolution of rising expectations
Indications of future multipolarity
Emotions are coerced, restrained and sublimated

Military:

\$120 billion annually on defense
Early sixties technology
First strike advantage
U. S. strategic superiority
Alert forces
2,455 nuclear countries
Implicit arms control important

In the East this mainly takes the form of the Sino-Soviet controversy; the European satellites also clearly have more freedom of action than they had under Stalin, and if the Sino-Soviet schism increases, they are likely to be able to exploit it to enlarge the areas of their independence. In the West, the European Economic Community (particularly as it is affected by the leadership of De Gaulle), and the attempts of the British to play the part of the honest broker between the United States and the Soviet Union point in the direction of a possible polycentrism.

One of the most important aspects of the early sixties is the obvious weakening of the European nation-state system, which seems to be passing. The state system is about six hundred years old, the nation system, about two hundred years old; therefore neither of these is necessarily to be thought of as a permanent feature of the historical landscape. They are passing in two separate ways. For one thing, colonialism, which was a significant part of the nation-state system, is almost liquidated. In one sense this results in a temporary strengthening of the nation-state system by creating more nation-states - many of which are violently nationalistic. In fact nationalism is now a world-wide political movement except in the continent of its

birth. From the viewpoint of past history, the white man's nation-state system is disappearing. He no longer runs the world. Even more startling, his own nation-states are being integrated in larger entities or federations. The Soviet super-bloc still runs the satellite nations, and it is difficult to believe that they will soon really be independent in the old style.

There is also the well known revolution of rising expectations, which in most places is associated with nationalism. While this revolution carries overtones of animosity, hatred, and antagonism toward developed states, by and large the emotions in these less-developed states are coerced, restrained, and sublimated. Let me describe what I mean by this. Take an example which is not directly appropriate to the under-developed nations, since I will use a modestly developed nation in my example. Consider Mexico, and assume for the moment that the Mexicans acquired a tremendous strategic superiority over the United States. In these circumstances one could confidently predict the Mexicans would notice that a portion of the United States, the southwestern United States, was once unfairly torn from Mexico in a war. Many Mexican nationals still live there, and are often badly treated. The Mexicans might well feel that this situation was intolerable, that no self-respecting nation could allow the oppression of their countrymen and the shameful legacy of the Mexican War to continue. There is no such irredentist movement in Mexico today. It is so obviously impractical that it would be silly for anyone to consider it. Any who did would be justly labeled crackpot or fanatic. In this sense, latent aggressive tendencies are coerced, restrained, and sublimated; they may show up in hostility and animosity; they don't show up in well-organized programs to recover the lost lands. This doesn't mean that such desires don't exist; it means they have no way of coming to the fore.

Similar situations exist around the world. One of the important possibilities in the next decade or two is that channels may develop for the expression of these emotions. This possibility may make a great difference to the stability of the world of the future.

It might be worth while, in passing, to make some comments on the military context of the early sixties, although we have already discussed the major points. According to a recent United Nations report, there are about \$120 billion per year being spent on military preparations world-wide. This estimate seems high, but no reasonable estimate will go much below \$100 billion. This money is being spent on the early sixties technology in which there is still a first-strike advantage. There still seems to

be a United States strategic superiority. Our forces now operate alert, which means that we can go to war on very short notice. There are, so to speak, 2.455 nuclear countries. The United States and the Soviet Union count as one each, England counts as .4, France is .05, Israel is .005, and China is an unknown quantity. Lastly, and perhaps most important, everybody understands that arms control, unilateral or bilateral, implicit or explicit, will have to play an important role if the situation is not to become explosive. Nobody believes that modern weapons systems should be treated as they were before World War I, when various munitions manufacturers such as Basil Zaharoff could sell any customer tanks and planes, and the British shipyards could design and build naval warships for any country. It is now well understood that munitions industries are government regulated; by and large most nations don't even want to get into the munitions business in a serious way.

With the military picture in view I would like now to suggest an analogy concerning the nation-state system which is somewhat forced and possibly a little misleading, but which seems to me to be enlightening enough to be worth making. This analogy occurred to me when I was re-reading Crane Brinton's book, Anatomy of a Revolution. (43) In this book Brinton discusses four revolutions to the Left--"progressive revolutions"--revolutions based more or less on the rights of man, as distinguished from counter-revolutions or reactionary revolutions. The four revolutions he considers are the British revolution of the 1640's, the French revolution, the American revolution, and the Russian revolution.

The analogy I wish to introduce by reference to Mr. Brinton's book suggests that the Western dominated nation-state system is in a sense a kind of world government. That is, if Martians had visited us in 1914 and asked, "How is the world governed?" we would have replied, "Through a nation-state system." "Who runs the nation-state system?" "Why, the Westerners do." This would have been a completely appropriate answer 40 years ago and even 30 or 20 years ago. Already much of the old authority has disintegrated. Many intellectuals do not believe that the current system will withstand the stresses and strains of the arms race and foreseeable political evolution. They ask (since the current system will pass and is obsolete), "Why should we risk war?" "Why should I risk my life to preserve this system?" This may be a perfectly reasonable position, though they may still be willing to risk war or to risk their lives in order to vote on the system which replaces the current one.

Crane Brinton asks the following question about the four revolutions: "What is it that these revolutions had in common?" I have listed some of these common elements in Table 29.

TABLE 29

ANCIEN REGIME MORALE

(Western Dominated Nation-State System)

1. Desertion of intellectuals
2. Vigorous but ineffectual reformers
3. Ineffective use of force in class interest
4. Well organized protest movements
5. Revolutionary classes who appeal to rights of man

Most important was probably the desertion of the intellectuals. That is, many or almost all of the intellectuals believed that the system under which they lived was corrupt, ineffectual, incompetent, or otherwise completely unsatisfactory, and would have to be reformed. Brinton mentions that in every social system the intellectual tends to be somewhat disaffected. In fact he comments, "An intellectual who is as satisfied with the world as he is with himself would scarcely be an intellectual."

The important distinction, he says, is that the intellectuals more or less agree. They are dissatisfied in the same way. They agree that the system won't last--at least a large number of them do. Partly as the result of the activities of the intellectuals, there were vigorous attempts to reform the system, but in each of the four revolutions, these efforts were ineffectual, and one could say that this is one reason the revolution occurred, or one could say equally well that it was impossible to carry through the reforms peacefully--that without blood and violence such changes could not be brought about. One can consider the arms control movements, the United Nations, foreign aid, Point Four, and peace movements as vigorous but very likely ineffectual attempts to bring about major reforms in the current system. At least, if they are not ineffectual, nobody has been able to point out a plausible route by which they may be made effective. They may turn out to be effective, but we have little reason for believing so today. However, this is not a prediction; I am simply pointing out that this is an open issue. I am not saying that these attempts cannot work, but that it is not obvious that they will work--or even more strongly, that it is not even plausible that they will work.

It may also be noted that those in charge no longer seemed capable of using force effectively in their narrow class interest. A nation which conquered half a continent with a handful of soldiers can no longer control street riots. Thus, even though there is an enormous disparity between the amount of the force available to the government and the force available to the revolution, it still turns out that greater force does not determine the events. The force is useless, or almost useless. There seem to be three major reasons for this inability to use effectively the coercive power available to the government.

(1) Doubts about effectiveness. (Many decision-makers do not believe that force is the answer to the problem. This lack of faith caused them to lose confidence, to lack sureness.)

(2) Anxieties about morality. Is it right to do this? (This is even more paralyzing than doubts about effectiveness, because even if one uses force and it turns out to be ineffective, one has just made a mistake; if it turns out to be immoral, one has sinned and one will pay for it. One of the reasons why the anxiety about morality is important is that the feeling of guilt and ambivalence will make a dedicated prosecution of the effort impossible--there will be too much disunity, too much disagreement, too much necessity to mollify or retreat before political opposition. The will to fight or otherwise continue the conflict will be eroded before it has even started.)

(3) As a result of all the above, there was some doubt as to the present or continuing loyalty of the instruments of force. (The soldiers might disobey, the officers might disaffect. One could no longer depend on discipline and cohesion.)

None of the above implies that force cannot be used effectively. It can be used in the defense of universal values, values which everybody is accepting. It simply states that in all the revolutions force could not be used by the governing class in their narrow class interests (or in our case in the narrow national interest). For example, fifty years ago we would have invaded Cuba without a moment's hesitation; today, we could not even help the rebels beyond transporting them to the beach. (44) Suez is another example of how the question, "Are we right?" paralyzed and disunited a Western nation.

In addition, there are well-organized protest movements in the pre-revolutionary era. These are staffed by and large, by people who feel frustrated or alienated, or disaffected by the system. As a result of an oppression great enough to stimulate discipline, solidarity and intensity but not so great as to wipe them out, this movement becomes supplied with leaders, organization, and followers.

In our nation-state system we do not yet have well-organized protest movements, but we are getting them. The unilateralists in England, much of the peace and anti-civil defense movement in the U.S., the neutralists around the world are asking and being asked both to organize and to lead protest movements against the existing regime. Finally, the "revolutionary" groups, while small in size, have such simple and satisfying slogans--Peace, Progress and Reform--that they have a wide appeal. These protest movements organize the revolutionary classes by such basic appeals as the rights of man. Those who are trying to defend the existing regime sound niggardly and narrow. They seem to be trying to protect property, privilege or order, where the other side seems interested in human beings. There is little or no concern for the possibility that important mechanisms may be destroyed or disturbed.

The Soviets are also on the offensive--an offensive with two prongs. First, to the underdeveloped nations they no longer tend to emphasize how sympathetic they are with the troubles of the poor. Rather they point out that if these nations want reforms and progress, they, the Communists, have the techniques and motivation for sweeping away resistance, forcing capital investment, disciplining and educating all, etc. Second, to the West the communists hold forth fear of the arms race. "Unless we arrive at a detente or at least a modus vivendi soon, everybody will be blown up." There is just enough truth in both prongs of their campaign to make their story fearfully persuasive.

In all of the revolutions which Crane Brinton discusses, there is an initial transition period in which the moderates take over and, in cooperation with both the left and right, attempt to organize a new government of reform and progress. However, in three of these revolutions the moderates alienate the right by specific acts which cause the right to oppose them very fiercely, and then the moderates find they can no longer oppose some extremist group on the left (in all cases a group which was initially quite small). The extremist group then takes over and institutes a reign of terror which of course has great reforms. In two of the cases the reign of terror was followed by a "thermidor reaction" and finally a restoration. Many believe that this thermidor reaction is now occurring in the Soviet Union and that some kind of "restoration" may follow. Each of these periods has very characteristic attitudes. For example, during the reign of terror there is the attempt to remake man into something better than he may be, into a totally political animal with puritan virtues and superhuman character. The possibility of usefulness of the citizen's private life is

denied or de-emphasized, pleasures are eliminated, and in all ways people dedicate themselves (compulsorily or voluntarily) to the building of the new society.

In the restoration one sees the opposite reactions. There is emphasis on personal life and pleasure - even on corruption, laxity, gaiety, sometimes carousing and orgies. Both the Cubans and the Chinese now seem to be in the puritanical stage, the Russians seem to be relaxing but have not yet reached the state that we think of when we think of the English or French restorations.

B. The Early Seventies

TABLE 30

ENVIRONMENT OF THE EARLY SEVENTIES

Other Participants in Arms Race:

EEC and SU have US 1960 GNP
China has British GNP & SU basic industry (1960)
5-10 other nations may spend more than
\$1B/year on defense
10-20 nations may spend more than \$.1B
and less than \$1B/year

Technology:

Cheap, simple missile systems
Bacteriological and chemical warfare
Disguised or anonymous warfare
Doomsday machines?
Gigacycle computers
Ground effect machines
Small world

Other Political Strains:

Racism, greed, envy, and frustration
Population explosion
Ban-the-bomb movements
Nationalism, polycentrism, and multipolarity
West has Ancient Regime Morale

Since we are studying the entire decade from the early sixties to the early seventies and have just discussed the environment we are in and are leaving, let us now discuss the environment of the early seventies. Some of the things I might mention, for example, are that there will be a European Economic Community and quite possibly a European Political Community. Barring unforeseen circumstances in the near future, the European Community will have a GNP equal to about what the United States had in 1960, but it will be distributed among more people. It seems quite likely that, if China can handle her agricultural crisis, she will have a GNP of something in the neighborhood of what Great Britain had in 1960, but it will be distributed among 15 to 20 times as many people. Possibly more important and more ominous, the Chinese will have a capability in such basic industries as steel, coal, cement,

etc., about equal to what the Soviet Union had in 1960. In other words, they may have the same basic economic capability that the Soviet Union had in 1960. They will, of course, lack as many commercial goods as the Soviet Union had and will also be lacking in such things as electronic industries. One might, therefore, suspect that Red China would not be able to squeeze much surplus out of its enlarged industrial production to make life unpleasant for us. Yet, judging from the harsh measures already applied, Mao is likely to be considerably more effective than Stalin was in negotiating that kind of squeeze. If he is, then Red China is likely to take the following form during this period: a powerful industrial nation with an urban population of about 200 million set amid a vast rural slum with a population of almost 600 million. This rural slum will provide military and industrial manpower and food (as needed) but will probably not consume much of the industrial output. Out of this structure the Peking rulers can be expected to squeeze an arsenal of modern nuclear weapons--and to provoke a lot of trouble. With 600 million people near starvation, China can scarcely be a status quo power--or a reliable, open partner in arms control--regardless of whether we recognize its government, agree to its admission to the UN, or hand it Formosa.

There will be 5 to 10 other nations spending more than a billion dollars a year on national defense and possibly 10 to 20 nations spending between 100 million and one billion dollars a year. What will these nations be able to buy? As we have already discussed, there will be cheap, simple missiles and cheap, simple warheads available, as well as launching systems. The larger powers will be able, if they desire, to supply these weapon systems at a cost of about a million dollars a year or less per ready missile. What if the larger powers are unwilling to supply the missiles? Will these nations be able to obtain them on their own? I think the answer is almost unquestionably "yes" if they try hard enough. Hard enough means well within their existing budgets. However, there are likely to be all kinds of restraints, and in fact the early seventies may not yet see the era of the cheap plentiful weapons--only the U. S. and S. U. are likely to understand the technology in the early seventies.

I would like to pass over the other items under technology and comment on the last item under this heading. The world will indeed be small. The late John von Neumann put it very well as follows: (45)

"The great globe itself" is in a rapidly maturing crisis--a crisis attributable to the fact that the environment in which technological progress must occur has become both undersized and underorganized....

In the first half of this century the accelerating industrial Revolution encountered an absolute limitation--not on technological progress as such, but on an essential safety factor. This safety factor. . . was essentially a matter of geographical and political lebensraum: an ever broader geographical scope for technological activities, combined with an ever broader political integration of the world. Within this expanding framework it was possible to accommodate the major tensions created by technological progress.

Now this safety mechanism is being sharply inhibited; literally and figuratively, we are running out of room. At long last, we begin to feel the effects of the finite, actual size of the earth in a critical way.

Thus the crisis does not arise from accidental events or human errors. It is inherent in technology's relation to geography on the one hand and to political organization on the other. . . . In the years between now and 1980 the crisis will probably develop far beyond all earlier patterns. When or how it will end--or to what state of affairs it will yield--nobody can say.

Moreover, unless arms control or new developments lead to ways of controlling the vast destructive potential of our technology, it would seem almost certain that fear of the arms race will grow. As a result, the ban-the-bomb and unilateral disarmament groups will gain in influence. There may be, in effect, a rejection of the nation-state system, at least by the intellectuals and a corresponding decline in the morale, confidence, and strength of the Western States before we have worked out any replacement. In fact the ancient regime morale just described, or some aspects of it, may dominate and constrain Western capabilities to handle these problems.

It is likely that through the 1970s the emotions of frustration, greed, envy, and hate, as felt by some of the less well-developed nations, will still be restrained, coerced, and sublimated, but not to the extent that they are in the early and middle sixties.

Among the changes likely to make the late sixties and early seventies particularly difficult to cope with (at least analytically and maybe practically) may be the end of the bipolar political and military structure which has characterized the post-war period. Even though the world might remain mainly bipolar in the sense that the United States and the Soviet Union have most of the megaton bombs, it is likely that other nations with a relatively small number of megatons in their hands will in due course be able to exert a disproportionate leverage on the distribution of political power. In any case, other nations will have much greater political and economic power and a willingness to use this power than has been characteristic of the post-war world.

Rising nationalism, racism, envy, greed exacerbated by the population explosion, a partial frustration of the revolution of rising expectations, and the memory of real or imagined past wrongs--all of these may act as spurs to the wider acquisition of nuclear and other military capabilities and to an acceleration of technology while imposing new strains on whatever degree of international order may exist. We must not fall into the error of imputing to others our own sense of legality and restraint. A large number of the actors on the international stage are going to consider the old system as a corrupt, evil, and inefficient ancient regime designed to protect ill-gotten gains and privileges. As a result there may be bitter struggles between white and colored, rich and poor, developed and underdeveloped. These struggles could reach levels of conflicts--waged with weapons of modern technology--that, even if relatively limited, might be more bitter and destructive than the religious and ideological wars of the past.

C. National Strategies

In discussing how to meet this complicated environment, it is useful to use the concept of the national strategy or to use the terminology of World War II, a Grand Strategy. A national strategy is an attempt to detail every aspect of our attempts to cope with the real world. This is, of course, much too complicated a thing to do, and I would like to restrict our attention to basically those things which are designed to meet the problem of the arms race and the Soviets.

TABLE 31

A NATIONAL STRATEGY SYNTHESIZES:

Capabilities		Foreign Policy
		Sub-Limited War
Objectives	in	Local War
		Central War
Tactics		Arms Control
		Domestic Policy

If we do this, then, as shown in Table 31 above, a national strategy deals with what our capabilities are, what our objectives are, and the tactics we will use to exploit these capabilities to achieve our objectives. It discusses more or less as an integrated whole problems of foreign policy and all the problems of violence, running from the sub-limited war to the central war, and finally, domestic constraints and capabilities, including values, that come into play or may be affected. A national strategy need not be simple; it can have many complex elements and even contradictory elements, in order to hedge against disappointing events and to be in a position to exploit favorable events. It may also contain many elements to increase its flexibility, not only in the narrow sense, but in the broad sense of being able to change the entire strategy. The essence of national strategy is to take a basic theme and then design some intelligence programs under this basic theme.

Actually, of course, a complete national strategy is both too subtle and too complicated to put down on the written page. In fact we do not normally expect people who study operational research, system analysis, on strategy and tactics even to attempt a document of the scope required for a dissertation on national strategy--that is, the government does not order a

national strategy to be designed by contract. People who write books or basic papers on national security sometimes do attempt to discuss national strategies. Such authors as Kissinger, Rostow, Strausz-Hupe, and various members of "right-" and "left-wing" ground have all attempted to perform a high degree of integration. It must be clear that one would not really expect a good job on this except from somebody of the caliber of one of the greats--say, John Stuart Mill, Karl Marx, Thomas Jefferson, Abraham Lincoln. However, even though we do not expect a company or institute working on a contract to turn out a national strategy of the depth, intensity, persuasiveness, and scope that one would wish, such organizations can perform what is in effect the systematic library research portion of these national strategies. They can also be as creative as they are capable of being without expecting to truly initiate or propose a new system. In doing so, they may well formulate the problem in a way that is helpful both to the decision-makers in government and to the future unknown genius who will write The Book.

There are also many by-products of an attempt to deal with the problem of national security and international order in terms of national strategies, and as discussed later, these by-products may have more than enough value to justify the attempt. In fact it is for the purpose of these by-products that we have started this line of investigation.

Fourteen Alternative National Policies

In order to give some orientation as to the range of strategies which a nation such as the United States might choose to follow, I will describe fourteen possibilities here. These descriptions are simply a first attempt to suggest some reasonable examples for study and evaluation and descriptions are superficial almost to the point of caricature. I have deliberately included some extreme samples which have almost no chance of being followed in practice, even if a good case might be made for them. It is, nevertheless, valuable to study them, in order to shed light on the more practicable examples we are most likely in fact to follow and to clarify the range of choices. Some typical strategies which might be discussed are listed below:

TABLE 32
ALTERNATIVE STRATEGIES

1. Act of Renunciation
2. Unilateral Initiatives
3. Minimum Deterrence
4. Rule of Law
5. Fortress American
6. Accept the Arms Race Reluctantly
7. Follow Technology
8. Not Incredible First Strike
9. Concert of Powers
10. The Aggressive Democrat
11. Credible First Strike
12. Protracted Conflict
13. Win
14. Preventive War

The first four strategies direct their major effort to slowing down the arms race, the first two by the use of "extreme" tactics. Strategies three to ten can all be thought of as variations of elements currently used--as such they can be thought of as representing some sort of "middle" way. The last five strategies take as their main objective facing up to the Communist threat, the last four using relatively extreme tactics. The strategies are neither exhaustive nor mutually exclusive; two or more can be combined or elements blended together to form a new strategy.

One useful by-product of studying a group of such strategies might be to show that many or all of the extreme examples really are unsuitable. This in itself would be useful because many otherwise thoughtful people sometimes refuse to think seriously about the practical alternatives available; they assume that they prefer a more extreme strategy. If the extreme strategy can be shown by analysis to be undesirable instead of being rejected out of hand, its proponents could turn their energies and support to more feasible or desirable possibilities. However, because such extreme strategies intuitively seem so impractical, they are seldom thoroughly studied. Their actual difficulties, costs, and risks are, therefore, not fully realized, and perhaps their potentialities are not sufficiently appreciated either.

Let us now discuss each strategy briefly:

1. Act of Renunciation. This is the course urged by some pacifists. It is one of the two most extreme strategies listed, the other being preventive war. It has an ancient history, from early Christian teachings through the non-violent resistance preached by Thoreau and Gandhi, and is advocated today by some proponents of nuclear disarmament. As an ethical proposition the issues were clearly enunciated in the original manifesto of the Society of Friends to King Charles the Second on England in 1660:

We utterly deny all outward wars and strife, and fightings with outward weapons, for any end, or under any pretence whatever; this is our testimony to the world. The Spirit of Christ by which we are guided is not changeable, so as once to command us from a thing as evil, and again to move unto it; and we certainly know, and testify to the world, that the Spirit of Christ, which leads us into all truth, will never move us to fight and war against any man with outward weapons, neither for the Kingdom of Christ, nor for the kingdoms of the world.

It is important to note that the Friends would fight neither for the Kingdom of Christ nor for the kingdoms of the earth. They hoped that their teachings would be universally adopted, but even if they were not, and the Friends (because of their ideas) were temporarily to lose everything or almost everything, or whole countries were to lose their liberties because they applied these ideas, the Friends would not consider their policy mistaken. It is a strategy based on morality, not on effectiveness.

The ranks of the moral pacifists have recently been enlarged by many who argue that some form of renunciation is a better, more practical strategy than reliance on nuclear weapons, that it is less risky and more effective in accomplishing our national goals. Many of these "nuclear pacifists" are willing to use such low levels of force as local guerrilla warfare, or even conventional high explosive military operations, to resist enemy

occupation, but they would not use nuclear weapons even in retaliation. So they would forego the threat as a possible deterrence. Some hope that, by a single dramatic gesture, or a series of them, we could "reform" the Soviets (and the Chinese?) and then the rest of the world. Even if the program should be a complete or partial failure, we would at least eliminate those international tensions and aspects of the arms race that result from self-fulfilling prophecies. Others have less faith in dramatic gestures but hope that, over a period of time, they can expose the uselessness and immorality of force by precept and example. Even more important, we would renounce immoral activities such as holding tens of millions of innocent people as hostages to be killed if their government commits certain acts. This argument often concludes that at the worst the United States and Europe, and possibly the world, would suffer a relatively peaceful takeover, and the resultant tyranny would mellow with time. One of the basic comparisons to be made in considering this type of proposal would be to weigh the risk and horror of such an occupation (by the Soviets? the Chinese? others?) against the risk and horror of nuclear war.

Some other elements that might enter a renunciation strategy are the possible allocation of a really large per cent of the U.S. Gross National Product to foreign aid ⁽⁴⁶⁾ (as much as 50 to 100 billion dollars a year). There could be various types of "peace corps" going all the way from those occupants in the current technical aid program to missionaries and volunteer non-violent groups that could interpose themselves in various situations and risk their lives for the principles of peace and progress. This strategy could also conceivably be combined with the dropping of immigration bars. This would be done out of friendship on the principle that if we allow others to come freely to this nation, there would be less pressure to conquer us, greater opportunities for many now frustrated, and an over-all improvement in the world's standard of living.

2. Unilateral Initiatives. This strategy is a mixture of calculation and idealism, involving acts of renunciation so hedged that, if things go badly one can reverse one's policy. The advocates of this strategy are willing to accept tactical setbacks and are willing to reverse their strategy only if the tactical setbacks become major losses. This strategy might be combined with a large and flexible pre-attack mobilization base so that one might hope to deter provocation or mobilization by the other side with the threat of an appropriate counter-mobilization and, failing deterrence, be able to initiate corrective action either to prevent a future failure of deterrence and/or to control the consequences of the original failure. In foreign

aid, the peace corps, immigration, and similar measures, the unilateral initiative strategy could be similar to the renunciation strategy, though presumably on a lesser scale. In military policy, it might look much like the third strategy, which follows.

3. Minimum Deterrence. There are many strategies which could come under this heading, but the one I outline here emphasizes actions directed toward immediately slowing down the arms race and minimizing the consequences of nuclear conflict. A nation pursuing this strategy might procure a small but reliable and relatively invulnerable force having as its sole objective the deterrence of a direct attack upon the United States or its military forces. It would not procure any counterforce capabilities. It might even go far to avoid the appearance of possessing any first-strike capability or any willingness to threaten and risk all-out war over extreme provocation such as nuclear attacks upon allies. It would certainly not risk a war over lesser provocations. This minimum deterrence strategy would also avoid the offense-defense arms race that might be touched off by the procurement of an active defense against ballistic missiles or by extensive civil defense measures. Some hedges might be included, in particular, a pre-attack mobilization base for a counterforce capability including active and passive defense or a small civil defense program to save lives and alleviate other consequences of war but one not large enough to raise any fears on the other side.

In its non-military aspect, this strategy could include all the elements of the Unilateral Initiatives (number 2): willingness to negotiate, some accommodation, foreign aid, and similar measures. It presumably would place heavy emphasis on conventional forces for defense of "third areas" but not at the expense of encouraging an arms race even in this area. In fact, some advocates of this strategy propose either non-violent resistance or a sort of guerrilla warfare as a last resort defense of third areas.

A common criticism of this strategy focus on its domination by short-run considerations. There is a tendency to refuse to balance possible long-run advantages, even in terms of the arms race, against short-run disadvantages. It is, for example, conceivable that one might wish to arm in order to negotiate disarmament, but this tactic would be ruled out in a strategy of minimum deterrence. Or the inadequacy of the defense of the third areas may force these countries to procure their own weapons, and, thus, this strategy could in the long run accelerate the arms race.

Comments on First Three Strategies

All three of the above strategies involve the danger that they could well end, even if the United States were successfully defended, by turning the rest of the world over to the Soviet bloc. In a sense, this result would not be surprising. It should almost be expected.

One major aim of the first three strategies is control of the arms race. Many do not believe that either the Americans by themselves, or the Americans together with the Russians, can do this adequately. Therefore, it might be argued, "Why don't we turn the job over to the Russians?" One way to do this effectively is for us to get out of their way. It is hoped they will then almost certainly try to discharge their responsibilities. One had the feeling that this attempt to turn over control of the arms race to an aggressive, forceful nation is a strong, if usually unconscious, motive of some proponents of the first three strategies. However, this motivation is certainly not necessarily true of the majority of the proponents. Adherents also point out that a Soviet take-over of the rest of the world (47) is not inevitable in any of the above strategies if for no other reason than that, once we removed ourselves as a threat, internal divisions might develop in the Communist camp--divisions likely to be increased by any attempt to absorb or conquer most of the world. Furthermore, by adopting a less aggressive and more constructive posture, we increase our ability to wage psychological warfare for the minds and hearts of men. Lastly, by reducing the strategic military competition, we would remove some of the motivation for such a take-over. In any case, the feasibility and possible consequences of such a "take-over" need to be studied.

Indeed, some argue that one can prevent a Soviet take-over by encouraging large regional groupings and possibly by arming them. The most obvious possibility is a politically united Europe. In fact, many believe that if Europe does not fall into Soviet hands, but the rest of the world does, this will not change the strategic balance, at least in the short and immediate run, and that the mere presence of an independent and armed Europe and United States will force the Soviets into reasonably restrained behavior that would make it impossible for them to take over the rest of the world.

4. Rule of Law. One alternative to the war system is the substitution of law for sovereign use of force. The war system might wither away if nations got in the habit of resolving disputes through adjudication, arbitration, some sort of relatively peaceful ritual (for example, as by medieval jousts or the

potlatch wars of the California Indians), or by submission to some sort of international court. While it is unlikely that, in the absence of international legislative and enforcement machinery, the process would go all the way, it is possible that some startling improvements could be made over the current international disorder. This strategy could involve any of the following unilateral steps: (1) Repeal of the Connolly amendment. (2) If not this, at least settlement of minor disputes on a legalistic basis (that is, instead of asking in the Congo which party favors us, simply ask which has the best legal case.) (3) Encouragement of more frequent use of the United Nations to settle disputes. (4) Attempt to reform the United Nations to make it a more effective instrument. (5) Encouragement of one's allies, neutrals, and even opponents, to follow a similar line. The corresponding military strategy could be almost anything, though the Rule of Law probably would not fit comfortably with the military programs of the last five strategies.

5. Fortress America. It is not inconceivable, particularly given modern technology (for example, a limited doomsday machine), that the United States might simply decide that allies are not essential; that it can defend the western hemisphere, or the northern part of the western hemisphere, by itself, and that it need not assume any "vital" interests in the rest of the world. At the minimum, the United States might try to isolate itself from unfavorable military developments in foreign nations by a combination of hemispheric alliance policy and enough active and passive defense to be able to protect physically against all, except perhaps the largest, powers. One would then avoid provoking these larger powers and at the same time have adequate deterrence systems against them.

This policy would not necessarily involve deliberately turning over the rest of the world to the Soviet Union, but it would at least mean that we would accept no international obligation that would seriously commit the welfare, prestige, power, or security of the United States. Adherents of this policy believe it could include low budgets for national security, smaller attention to foreign aid programs, and, hopefully, a return to low domestic budgets. However, it could conceivably mean the opposite: a garrison state, with all that this implies for budget and domestic policy. The military and technical possibilities of this strategy especially deserve to be examined since it is, after all, conceivable that we might be forced into such a strategy.

6. Accept the Arms Race Reluctantly. One might adopt the attitude that one cannot really do much about reversing or even slowing down the arms race, and that we might as well adopt a common sense attitude toward defense and deterrence problems rather than tilting with windmills or worrying about fearsome but hypothetical possibilities in search of total solutions. The advocate of a strategy based upon this attitude might agree that there is no necessity to accelerate the arms race deliberately; we can still be judicious and prudent about the weapons systems we procure and about the systems we encourage our allies to procure. One might even strive for limited agreements to slow down the more dangerous or destabilizing aspects of the arms race so as to buy time for adjustment, while keeping always in mind the fact that in a short time, five, ten, or twenty years, all such agreements or practices will be outmoded by newer technology, information, and doctrine.

Recognizing that there may well be wars and crises, one should certainly try to be in a position to survive any war that does occur and, as much as possible, try to exploit these wars and crises in order to improve one's position in the post-war or post-crisis international order. However, all of this would be done more or less on an ad hoc pragmatic basis without trying consciously to reform the world or to guide the history of the next thousand years.

As part of the same pragmatic approach, one could try to negotiate certain relatively simple technical agreements which would have little or no political effect, but which might do much to decrease the immediate risk of war. For example, we might install communication systems between Soviet and United States headquarters. Then, if unexpected events occur, the two countries could communicate directly with each other. There is a possibility that we could arrange not only to pass information to the Soviets, but to establish some reliable procedures for verification. Then, if a complicated accident or crisis occurred, each nation would have facilities so it could explain its actions and give essential information to reassure the other side, and thus decrease the possibility of a mutually unwanted war.

7. Follow or Lead Technology. This strategy is based on the attitude that it is not only impossible to "fight" or impede technology, but undesirable; at a minimum one should adapt to its requirements, and possibly one should even try to lead. One would especially push development and procurement in such prestige areas as space, undersea warfare, bacteriological and chemical

warfare with incapacitating agents, small, clean atomic weapons, and other items which are militarily attractive and even glamorous. Similarly, in making calculations as to desirable weapons systems, one would give a decided plus to those systems which push one into the future.

Accepting the implications of the arms race might include facilitating the distribution of nuclear arms to allies or even encouraging neutrals to procure modern weapons systems. This distribution need not be reckless; one could attempt to build up customs, practices, even rules of engagement or of use, but not at the cost of seriously limiting the military usefulness of the devices. One would simply try to make means commensurate with ends and to avoid unnecessary risks and damage.

This strategy also could easily be combined with a pragmatic approach to international developments. One could discourage long-range planning, attempting only to meet problems as they arise. Most people who like this strategy tend to be against the notion of utilizing either war or crisis to trigger or negotiate major changes. They generally believe that deterrence against occurrence of all-out war can be made to work, and they are often unwilling to hedge against the failure of their expectations. Some technically-minded adherents of this point of view would be willing to see doomsday or near-doomsday machines built for Type I Deterrence. They argue that the probability of use is so low that it will not in fact be appreciable even over a fifty-to-one-hundred-year period and that by then the machines would doubtless be dismantled because of developments in the intervening years. In any case, not having a long-range point of view, except in the area of technology, they often find it difficult to take other long-range considerations seriously enough to accept current sacrifices for what they feel is an unknown and unknowable factor. While at first sight the attitude may seem irresponsible, one can find many responsible and knowledgeable people who feel this is a preferred strategy.

3. Not Incredible First Strike. This strategy calls for a low degree of credible first-strike capability. The exact degree can range all the way from the all-but-incredible to an attempt to make the risks involved in a first strike comparable to World War II. The basic notions are: first, one needs some Type II Deterrence in order to pursue an effective foreign policy; lacking a third alternative to a choice between peace or limited war may increase the risk of aggression. Second, if the enemy gets too provocative or reckless, one would wish to have the capability to destroy or "reform" him. Third, controlled reprisal is either not as effective or as safe as some form of controlled counterforce for either of these functions.

Because of the uncertainties, the estimate of "not incredible" may rely heavily on the manipulation of irrationality (as in the threat or committal to initiate near-mutual homicide in retaliation to provocation). The "not incredible first strike" strategy is based on a somewhat less bizarre degree of irrationality than in the case of committal to near mutual suicide, so much less bizarre that we could conceive of its occurring. However, the threat may still be more dependent on the honor of the nation being committed, or on the provocation touching off an emotional reaction, than on an objective calculation of the risk and harm involved in going to war, as opposed to the risk and harm in accepting some other alternative (such as limited reprisal, accommodation, or appeasement)--particularly if, as is usual in such calculations, the possibility of great future harm compared to immediate harm is discounted.

9. Concert of Powers. This strategy explicitly recognizes that the world is roughly divided into three great groups: (1) a reasonably prosperous group enjoying varying degrees of satisfaction but with a great deal more than chains to lose; (2) a group in the "take-off" stage of economic development; and (3) a group whose prospects look dark indeed! Each group contains about a third of the world's population. The first of these groups, which includes the Soviet Union, most of Europe, North America, Australia, and Japan, has profited greatly from the application of modern technology--almost all of their citizens have a relatively high standard of living. Furthermore, the chief gains to be made in the future in terms of improved standard of living and economic or military power can be expected from internal development and peaceful intercourse, rather than from aggressive conquests. Barring almost fanatic ideological motivation, these countries are essentially status quo powers. Advocates of the Concert of Powers strategy believe that these powers ought to be able to get along together well enough to adjudicate and negotiate their differences, and limit the consequence of violence by the rest of the world in at least as satisfactory a manner as the concert of Europe did between 1815 and 1914; in fact, they should do better since the imperialist and colonial rivalries which were then the main bone of contention are now much less likely.

China poses an important problem in this strategy, but, presumably, if the status quo group could get together it could restrain China, particularly if these nations could arm India and ally themselves with her.

The "ruling" or leading group need not try to exploit the other groups, but try merely to control the diffusion and use of modern weapons and the escalation of local crises into global confrontations. Indeed this strategy could, and probably should, be combined with large foreign aid and technical assistance programs since an increase in over-all safety should be reward enough for the developed nations.

One possible step toward such a system would be the negotiation of a "Hague" convention with teeth in it against the use of nuclear weapons in warfare. Such a convention could simply be a one-clause condominium on world affairs between the United States and the Soviet Union to the effect that both will refrain from the first military use of nuclear weapons under any circumstances and in addition will jointly strike any third power which uses nuclear weapons in a military operation.⁽⁴⁸⁾ Other nations should be encouraged to adhere to the convention, thus making it a truly international accord. If effective, such a convention might be more useful than a test suspension in discouraging the diffusion and controlling the use of nuclear weapons. It is also a major precedent for a very limited but possibly adequate "world government".

10. The Aggressive Democrat. The aim of this strategy is to extend the area of democracy, this area being defined by the positive characteristics of the government and social system, and not by its degree of anti-Communism or any other negative characteristic. The ultimate aim would be to make the world democratic. The direct role for force in achieving this aim would be de-emphasized; the Aggressive Democrat would attempt to play midwife to those democratic forces which exist everywhere, trying to give them enough support so that they will reach the cohesion and strength necessary to emerge victorious over their opposition. The terms "proselytizing", "missionary", and perhaps "revolutionary", could also be used to describe this strategy.

While formally eschewing rollback, at the minimum this strategy would attempt to put itself in the van of modern revolutionary and nationalist movements and cooperate, to some extent, in the violence that these movements often engender. However, its weight would be usually on the side of peaceful change even at the cost of some compromise with the ideal. The main weapons include all kinds of aid (technical, financial, military, economic, administrative, educational, and political), solidarity-building activities (Peace Corps, cultural exchanges, reciprocal visits by common and uncommon men, declarations of friendship and support, etc.), and pressures and inducements to reform or improve the social and political structure of the movement or

country that is being supported. While the main emphasis is on non-military programs, the use of force--particularly covert and "sub-limited war" actions against the Communist periphery and in defense of our "own" areas--is not barred. The strategy definitely includes a willingness, where it seems desirable, to fight in future Koreas, Congos, Indochinas. It very likely would also include special aid to democratic or anti-Communist movements that might undermine or overthrow Communist regimes such as those imposed upon Cuba and Guatemala. The more extreme versions of this strategy would encourage attempts at subversion in the Communist heartlands.

Some protagonists for this strategy would not discount the possibility that a vast and sophisticated offensive aimed at both activists and passivists alike within the Soviet Union might bring about a coalescence of the anti-regime forces. And, even if these anti-regime forces should be too weak to take over the reins, they might still stir up difficulties for the Communist leaders which could in turn be exploited. The Aggressive Democrat discounts the danger that Communist leaders might be provoked to strike with their nuclear weapons or start limited wars since he would spend enough to assure both an adequate second-strike and a limited war capability. Such military programs could be combined with arms control and a willingness to negotiate on other issues, but such negotiations would be "tough-minded". Little would be taken on trust and most offers would involve a quid pro quo.

This strategy could include an aggressive alliance or even an unification policy both for the United States and for the areas it is trying to defend. The obvious possibilities for unification are a politically united Europe, a North Atlantic Union, possibly including Japan, New Zealand, Australia, and perhaps partial or complete unification in Black Africa, Latin America, Southeast Asia, and other areas to encourage prosperity and stability and reduce the danger of piecemeal subversion.

II. Credible First Strike. This strategy is similar to the "not incredible first strike" with an even greater capability to fight and survive a war. This in turn is supposed to lead to a greater willingness to risk war in various situations and possibly to a lesser reliance on limited war capabilities. While not as bellicose as the usual formulation of the Dulles' massive retaliation policy, this strategy would probably use the threat of massive retaliation to cover a range of situations which most strategists feel could better be handled by limited war or controlled reprisals.

12. Protracted Conflict. Advocates of this strategy base it upon a particular view of the Soviets and a theory of history. They argue that the Soviets are rigid and doctrinaire prisoners and advocates of an ideology that dedicates them to world revolution. Moreover, they believe that we are in the middle of one of the great transition periods of history and that the outcome of today's struggle may well determine the character of the world for the next thousand years. They analogize this struggle to the religious wars of the Crusade and the Reformation and predict that it will be long drawn-out and bitter, although interrupted by occasional periods of seeming thaw and accommodation. They stress the cost in weakness, confusion, and vacillation of having an ambivalent attitude toward the enemy. Since they regard the cold war as a struggle in which one or the other will be destroyed or converted by force, they deplore the wishful thinking and the lack of realism displayed by those who advocate conciliation and flexibility. They often accuse those who do not take Khrushchev's bellicose and threatening remarks at face value, (i.e., "We will bury you!" or "Your grandchildren will live under Communism!") of being unwilling to face unpleasant facts or of having the classic American weakness of being unable to cope with, or even recognize, the existence of the ideological political fanatic. (49) They accuse many Americans who pay lip service to various protracted conflict assumptions of being only too eager to grasp at the slightest intimation that the Soviets are or will rapidly become satisfied bourgeois, Chinese-fearing nationalists whose ideological utterances have as much relevance to their day-to-day action as the Sermon on the Mount has to the commercial transactions of a church-going businessman.

This strategy is similar in many ways to that of the Aggressive Democrat, particularly in its emphasis on capturing or combatting revolutionary nationalistic movements. While it rests upon a more or less "conservative" philosophy, it emphasizes psychological warfare and other aspects of the "battle for men's minds".

The strategy envisages long periods of pressure and counter-pressure, erupting into various degrees of violence. Although it has no one specific program, it aims both at resisting Communist thrusts and exerting counterpressures until the Communists are defeated, converted, or become so exhausted that they will in good faith settle for a stalemate. In particular, it envisages the possibility that, if we can hold or roll back the line, some spectacular opportunity for total success may emerge. Until that time, it contemplates using against the Communists many of the tactics which they use against us: guerrilla warfare; subversion;

threats of violence, including nuclear warfare; propaganda; support of right-wing and middle-of-the-road groups everywhere; and occasional--though reluctant--support of left-wing regimes where they seem tactically valuable as counters to Communist groups. Domestically, this strategy calls for a greater degree of mobilization to fight and win the cold war, and possibly a hot war.

13. Win. This strategy is similar to that of the protracted conflict except that it is not content merely to pursue an opportunistic "muddling through" policy of stalemate and small gains without having also a more or less definite blueprint of how victory is to be achieved. It is also rather more determined to change completely or conquer the Soviet regime--if necessary, by violent means. Although it has overtones of preventive war it would attempt to win peacefully if possible. One path to victory might be through a vigorous containment or rollback policy in the hope that such containment or rollback will cause great internal stresses in the Soviet Union which, if judiciously intensified by us, might cause revolution.

Even though this strategy has been widely discussed, relatively few details have been supplied on how containment or a modest rollback is likely to be translated into ultimate victory. Even the meaning of the term "victory" is not exactly clear. This lack of details raises the suspicion that advocates of a "win" strategy either haven't thought the position through or are really thinking of preventive war at some opportune moment.

14. Preventive War. This strategy accepts the idea that we wish to win and that we must be prepared to win through a thermonuclear war since the advocates believe there may be no alternative. It prepares to fight that war, though it may not explicitly admit this. The execution of this policy presumably would take place during an intense crisis or as a result of the escalation of a small war. A preventive attack would be likely to result in a controlled war, accompanied by an offer to the Soviets to call the war off under certain conditions. The offer would most likely be made not to the Praesidium but to some other Soviet group, possibly the military.

The notion of preventive war is so abhorrent to almost everybody in the West that even those who feel some inclination toward this strategy have, so far as I know, never studied it. I suspect it deserves some study, again partly with the idea of showing how risky and difficult it is, and partly to fulfill an intellectual obligation. If we are attempting to look at the total range of choices, we should study both unilateral disarmament and preventive war.

It should be noted that both the unilateral disarmament and preventive war strategies tend to take the same cataclysmic view which assumes that any of the more moderate strategies would be disastrous. We must, these strategists hold, go to the limit; they simply go to different limits. (50)

I would argue tentatively that both the act of renunciation (unilateral disarmament) and preventive war strategies are choices of despair. In this connection, it is interesting to note that Bertrand Russell in the late forties came perilously close to advocating preventive war. (51) In a certain sense, his current position is unchanged from the one he took then: it is simply clear now that we will not use our military power to force the Russians to give in to us; therefore, it follows that we must give in to them. It is, of course, true that Russell preaches this doctrine to both sides, but almost nobody believes that the Soviets will listen or even be much affected by it. We may be less confident of deafness in the West.

In Summary

I have already mentioned that the major objective to the first three strategies is the possibility that they might result in a Soviet conquest of much or all of the world. Alternatively, if the Soviets do not do so, we might have to rely on them to protect these areas and us from the Chinese.

The major objection made to the last four or five strategies is that they do not pay enough attention to slowing down and controlling the arms race. Indeed, even their proponents often agree that they might lead, at least in the short run, to an acceleration of the arms race.

The differences between the first set and the last set of strategies reflect the fact that those who worry a great deal about the arms race tend to de-emphasize the challenges and threats presented by the Chinese and Soviet Communists, while those who worry about the Communists tend to de-emphasize the most menacing characteristics of the arms race.

Many of those who adopt the middle six or seven strategies worry more or less equally and seriously about both problems. They often find themselves under internal psychological pressure to re-evaluate one or the other problem and thus make the remaining problems at least seemingly more manageable.

All three of the above views may, of course, turn out to have been excessively preoccupied with the possibility of disaster. It is not inconceivable that the balance of terror or other mechanism will deter or prevent attack, provocation, escalation, inadvertence, and so on, and that we are now entering an era of unprecedented stability, marred only by "border" skirmishes and minor battles, that the major frontiers and power groupings may remain basically unchanged or change peacefully over the next century or two, while the war system withers away. While one can make this view modestly persuasive, it is hard to believe that most of the persuasion does not stem as much from wishful thinking as from realistic estimates of the degree of rationality, caution, flexibility, and good will likely to be available.

In the absence of luck, skill, and inspiration backed up by courage, energy, and intensity, the twentieth century may yet see: (1) another name joining the company of Alexander the Great, Attila the Hun, Ghengis Khan, Tamerlane, Napoleon, and Hitler; (2) a war more mutually destructive and pointless than World War I; (3) a war which is both destructive and yet perhaps "worthwhile", as I believe World War II was; (4) the total decline of our civilization, or some other unpleasant result of the use or threat of violence.

If problems of this global character are to be examined at all by the scholar and technician, they must be approached--at least part of the time--in a global framework. That is the main reason for urging that some attempt to make to think in terms of over-all national strategies such as my 14 examples. Such thinking helps set up basic contexts which can be used to facilitate integration, confrontation, and communication. At the minimum, it can help in bringing about what has been called second order agreement. (A first order agreement would be a consensus on substance or policy; a second order agreement would be an agreement on the disagreement, a non-controversial description of the controversy.) In principle, disagreements can be traced to differences in values, assumptions, and reasoning (calculations). A systematic discussion of even such a small and arbitrarily limited and defined set of strategies such as I have just outlined would bring out a careful discussion and description of the basic values held by various protagonists. It would also result in criticism, documentation, and explicit recognition of lack of documentation of assumptions. Finally, it would contribute to correction, amplification, and sophistication of reasoning.

NOTES

1. This document, prepared from notes and tapes covering recent briefings by Herman Kahn, supplies some background on the basic technological and strategic context in which important problems of deterrence, defense, and foreign policy are likely to be set in the next decade or two. The briefings drew upon materials that Mr. Kahn had prepared before he came to the Hudson Institute and from work performed on contracts which the Hudson Institute has with the Martin Company, Stanford Research Institute, and the following agencies of the Office of the Secretary of Defense: Office of Civil Defense, and International Security Affairs (under ARPA Contract No. SD 105).

The use of several taped recordings has caused unevenness in coverage. In the final report, parts will be amplified and others condensed. The current style of presentation varies between the colloquial and informal and a more formal presentation of material which comes from works-in-progress at the Hudson Institute.
2. A technological revolution indicates a big change such as the introduction of steam power, electric power, atomic power, or a quantum jump from kiloton to megaton--a change significant enough to render a prevailing doctrine or a strategic posture obsolete.
3. At one point in the early fifties, I had a conversation with an Air Force friend. I pointed out these possibilities. He indicated that he was not concerned about them. He said the Soviets did not have the operational capability. I then asked him if he thought we had the capability. And he said that every pilot with an assignment in the Emergency War Plan Mission could perform the kind of operation which the Soviets would require to attack and destroy our strategic forces on the ground. In fact, it was almost their standard training mission. I then asked, "Do you mean to say that the Soviets could not put together, say, one wing of bombers with some refueling capability on the general scale of our SAC pilots?" He said he didn't think so. I said with some asperity, "You mean to say that they couldn't find one or two dozen people with the skill of our worst pilots?" He said, "That's right." I then queried, "Are you implying that the Soviets have spent billions of rubles on their strategic air force and that they can't fly the planes they bought?" He said smugly, "You put it very well, Herman." I later checked into the matter as far as I could and his estimate about the Soviet operational capabilities did seem correct. The next time I saw him I conceded he might be right, adding, "But it's a helluva way to run an air force." One can never be certain, even if the old intelligence is correct, that the Soviets might not develop some new capabilities, and since they don't have to develop their entire air

force, but just a small portion of it, it might be some time before our intelligence people picked it up. See, for example, the discussion on the Japanese attack on Pearl Harbor in On Thermo-nuclear War, pages 412 to 414, for an almost exactly analogous case of the rapid development of specialized forces to be used in a surprise attack.

4. Such effects are now taken seriously, as was made clear in a recent speech of President Kennedy's in which he said: "We are spending great sums of money on radar to alert our defenses and to develop possible anti-missile systems--on the communications which enable our command and control centers to direct a response--on hardening our missile sites, shielding our missiles and their warheads from defensive action, and providing them with electronic guidance systems to find their targets. But we cannot be certain how much of this preparation will turn out to be useless--blacked out, paralyzed, or destroyed by the complex effects of a nuclear explosion." (See On Thermonuclear War, pp. 428-432, for a description of some of the subtle weapons effects and the possibility that they might be overlooked.)
5. To say you're not a priority or even a legitimate target doesn't mean that the enemy won't drop bombs on you. It means that there is no simple military reason for dropping bombs on you. There well may be some other reasons. Or it may be done without any reason.
6. See discussion on Doomsday machines in On Thermonuclear War, pp. 145-160.
7. "Report on a Study of Non-Military Defense," R-322-RC, Rand Corp., June, 1958.
8. It is possible, of course, that a particular nation might value military power more highly than people and property. Some observers believe that such a priority of value is plausible in the case of the Soviet Union and China.
9. A U.S. "first strike" could occur, for example, in a situation where the Soviets had launched an all-out ground attack against NATO and our reprisal involved a SAC attack on the S.U. Technically this is a U.S. first strike.
10. See pp. 179-87 of On Thermonuclear War for a discussion on possible objectives of the defender.
11. Modern Arms and Free Men (New York: Simon & Schuster, 1949), pp. 144-146.

12. See the growth chart on expenditures for R&D--1940-1960 on p. 22 of this chapter.
13. Subject of a forthcoming Hudson Institute Report on jungle warfare and equipment by Cresson H. Kearny.
14. For example, the Department of the Army Field Manual FM 100-5, Field Service Regulations Operation, February, 1962, states in Section II, Chain of Command, Paragraph 32, "Initiative. On occasion, the loss of communication may preclude receipt of specific orders or direction by a subordinate commander. In such event he will deduce the action required based on his knowledge of the existing situation and will act on his own initiative. Inaction in the absence of orders is inexcusable."
15. From a speech by Honorable Robert S. McNamara before the Fellows of the American Bar Foundation Dinner, Edgewater Beach Hotel, Chicago, Illinois, Saturday, February 17, 1962, News Release No. 239-62, Department of Defense, Office of Public Affairs.
16. See On Thermonuclear War, pages 422ff, for a discussion of a four-fold coincidence--a menacing crisis, an inaccurate Eskimo, a communications failure, and some B-42's off course.
17. An incident occurred in Los Angeles not long ago. Some theater installed a new burglar alarm system and that very evening the cashier was held up and stepped on the warning button. The police called back and said, "Lady, you've got your foot on the button."
18. See On Thermonuclear War, pp. 321-324 for examples.
19. The Strategy of Conflict, Cambridge, Mass: Harvard University Press.
20. On Thermonuclear War, pp. 27-36.
21. Analysts usually argue that stability is most likely with a tit-for-tat relationship. Examination of a number of scenarios has convinced me that with the proper timing, a tit-tat-tit sequence is also likely--often more likely than either the tit-tat or the tit-tat-tit-tat sequence.
22. Also see quote by Secretary McNamara on page 26.
23. Though, in keeping with the ladder analogy, the highest numbered rungs are placed at the top, we will discuss the rungs in numerical order.

24. Common Sense and Nuclear Warfare, New York, Simon and Schuster, 1959.
25. A fascinating study could be done on the differences and similarities among the techniques used by the Soviets in various situations, such as those used by: (1) official negotiators in East-West confrontation; (2) official negotiators in international bodies such as the U.N.; (3) Khrushchev at the Summit; (4) Khrushchev in speeches, press conferences, etc.; and (5) unofficial negotiators and representatives in peace conferences such as the Coswa (Pugwash) conferences.
26. Escalation also includes any increase in the scope or level of violence.
27. Unless it is a double - double-cross as in the Minsk-Pinsk joke.
28. More likely this would have been pointed out as part of a previous ultimatum while we were still lower down on the ladder or "unofficially" in inspired stories about U.S. strategy, or by deliberate private leaks and conversations.
29. This does not imply that conditions in the late sixties or early seventies will necessarily be startlingly different, only that it is an open question. It seems possible but not inevitable that much of the current advantage in having the first strike may be eliminated or greatly decreased in the next decade.
30. See On Thermonuclear War, pp. 428-33, for a description of some of the subtle ways in which a weapons system can be damaged or rendered ineffective by nuclear weapons.
31. In international law, it is not legal to attack a city which is not being defended locally and not being used to aid the military forces directly.
32. See Paul Ramsey, War and the Christian Conscience, Duke University Press, 1961.
33. Changing Patterns of Military Politics, The Free Press of Glencoe, Ill., 1962, p.44.
34. See Hans Speier, Social Order and the Risk of War, George W. Stewart, Publisher, N.Y., 1952, pp. 223-229.
35. Eible-Eibesfelt, "The Fighting Behavior of Animals," Scientific American, Dec., 1961. It is well-known that wolves when defeated in combat by other wolves offer their throats and only then are spared. See appendix for more discussion.

36. See Chapter VII for more discussion of the Chinese military and associated deterrence problems.
37. In the real world, damage is a complex phenomenon and the best way to render the other side's missiles ineffective may be to attack some of the system elements (pp. 128-130 of On Thermonuclear War) such as command and control, or to damage by means of subtle weapons effects. (See pp. 428-433 of On Thermonuclear War.)
38. The real world analogue might be some very hard missiles or some missiles that are very well concealed, perhaps by mobility, or one might think of the 20 missiles as being a sort of irreducible (2%) survival from a well executed attack.
39. The real world analogue would be "peacetime" campaigns against Polaris submarines or even carefully conducted campaigns of attrition at hidden or land-mobile missiles. Such campaigns could take months.
40. See On Thermonuclear War, pp. 195-199 for a discussion of the imponderables and pp. 428-432 for the possibility of unexpected physical effects.
41. See discussion on pages 80 to 82.
42. See On Thermonuclear War, pp. 202-204, 299-300, 440 for details. I also discuss in On Thermonuclear War many possible examples of unexpected U.S. weaknesses; see, for example, pp. 422-425, 428-433, 434-437.
43. Prentice-Hall, Inc., N. Y., 1938.
44. Cuba is a very good example of the three reasons. There are real doubts as to whether an invasion by the Marines really is an answer to Communist penetration of the Western Hemisphere; the morality of an invasion in light of U.S. treaty obligations and pronouncements is questionable, to say the least, and whether or not U.S. troops could be depended on to suppress a vigorous rebellion by Cubans is at least an open question.
45. Fortune, June 1955.
46. This is often justified by three "practical" arguments. First, by inducing the Soviets to match our spending or suffer a vast propaganda defeat, we make it financially impossible for them to afford modern weapons systems. Second, to the extent that our popularity is increased by such open-handed generosity, it will become more difficult for any nation making a pretense at morality

to attack us. Lastly, the use of American resources for foreign aid will diminish the unemployment and industrial stagnation which some supporters of this strategy regard as the primary cause of American armament.

47. Some vigorously contest the notion that world domination is any longer a Communist objective--if it ever was.
48. See On Thermonuclear War, pp. 240-43, for discussion of this suggestion.
49. One is reminded of the comment that it was perfectly clear to Chamberlain that he could not treat Hitler as he would a Birmingham businessman. It was too apparent that Hitler was another breed. Chamberlain recognized this and therefore dealt with Hitler in the same suspicious and skeptical fashion that he would have with a Manchester businessman.
50. I remember a joke in the late fifties, very common among some of the more depressed research analysts, that shows this relation more clearly. The following recommendation was given to Eisenhower: he was to call up Khrushchev and say, 'We surrender; if you don't accept our surrender by twelve noon, we will hit you.'
51. Some supporters of preventive war or near-preventive war have the same motivation as some unilateral disarmers--control of the arms race. For example, the London Observer carried (on November 21, 1948) the following story:
Lord Russell told 408 London students and school teachers at a New Commonwealth Schools Conference at Westminster School yesterday,
"Either we must have a war against Russia before she has the atom bomb or we will have to lie down and let them govern us. Like all dictators, Stalin and other Soviet leaders are living in a fool's paradise. They don't realize the strength of our resources and that the U.S., Britain and the Commonwealth and other Western powers would win any war now. That is the main gravity of the situation." He did not believe that Russia had the atom bomb yet, as experimental explosions would have been detected. But she would have it soon and would then be much more difficult to argue with. An atomic war would be one of extraordinary horror, but it would be the war to end wars.
Later he was challenged on this point by a London schoolboy who asked, 'War is as old as man. How can we end it with a single stroke?'
Lord Russell replied:

"Many things which are as old as man have been ended. Once everybody was a cannibal except those who were eaten. There are only two independent states left in the world today--and Britain is not one of them. After an atomic war only one would be left."

Before they were tempted to paralyze any war effort, trade unionists in Western Countries should be taught that the Soviet way of life had nothing to offer them. Fearing the horror of a future war was no way to prevent it. "Anything is better than submission," he said.

In a subsequent letter to the Observer, Russell made clear that he did not advocate immediate preventive war, but merely negotiation from a position of strength with the threat held in the background. His current position in favor of disarmament (either unilateral or bilateral) can be considered as stemming from the same fear of the arms race but changed technical circumstances.

CHAPTER III

SOME STRATEGIC ASPECTS OF CIVIL DEFENSE IN CRISES

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CHAPTER III

SOME STRATEGIC ASPECTS OF CIVIL DEFENSE IN CRISES

A. War and Deterrence

The middle of the twentieth century had added new aspects to the theory and practice of war, probably the most striking of which is the staggering scale and vigor with which war can now be waged. History has known wars in which close to 100 percent of a belligerent population were casualties in one form or another. These wars, however, were relatively local geographically and, when the antagonists were at all comparable, involved times of months or years. Currently it is technologically conceivable under conditions of lack of warning and malevolence of attack that even unequal antagonists could symmetrically obliterate almost everything valued by either of them in a few hours or less. It is hard to envisage any nation voluntarily starting a war which might have such an outcome. Nevertheless, unless the United States and the Soviet Union can make some more stable alternative arrangements, each must either maintain a capability for devastating war (which inevitably entails some risk of such a war) or else throw itself on the mercy and good will of its opponent. Both sides have decided to buy and maintain large thermonuclear establishments. It therefore behooves both sides to carefully examine their objectives and policies for the establishment as a whole and for each component. We will be examining civil defense in the context of over-all objectives and policies.

U.S. Military policy currently seeks to achieve or contribute to at least nine broad strategic objectives. They are the following:

1. To deter or prevent a direct, deliberate and large scale countervalue-element attack ⁽¹⁾ on the United States. By large scale countervalue-element attack we mean any large-scale or all-out attack with deliberate or avoidable countervalue elements. These include not only the straight countervalue attack but also the mixed counterforce and countervalue attacks, such as the counterforce plus bonus attack. ⁽²⁾

2. To deter a controlled reprisal ⁽³⁾ against the United States--that is, a relatively small-scale countervalue nuclear attack against the United States as part of limited strategic retaliation for the purpose of coercing certain terms from the United States.

3. To deter a counterforce ⁽⁴⁾ action against the U.S., whether large-scale or small scale, for the purpose of coercing certain terms from the U.S.

4. To deter extremely provocative actions short of direct attack on the U.S. (for example, a nuclear or all-out conventional strike against Europe).

5. To deter or otherwise prevent more limited incursions upon the non-communist world, provocations less than war in vital areas (Berlin blockade), or attacks upon less vital areas.

6. To limit damage to U.S. (and Allied) population and wealth and to improve the military outcome for the U.S. should a war occur.

7. To reduce the likelihood of an inadvertent thermonuclear war breaking out; for example, by accident, misunderstanding, or miscalculation.

8. To control and limit both the arms race and the threat of or use of force in settling disputes.

9. To do all the above so as to preserve and promote our democratic values.

We do not here attempt to judge the relative importance of these various objectives. It cannot be denied that during the past decade most of them have played major parts in the formation of U.S. defense policy. The objectives are to some extent competitive and inconsistent, i.e., we may wish to arm NATO with nuclear weapons. This may help achieve 4, 5 and perhaps 6 at the cost of a lowering of 7 and 8. Under modern conditions it is even possible to design a system which meets some objectives well but does very badly on others. For instance, a doomsday machine ⁽⁵⁾ would, in a sense fulfill numbers 1 and 7 quite well but would make impossible other goals (for example 6). On the other hand in most situations our objectives are primarily complementary; for many of them a catastrophic failure is unlikely to be made up for even by spectacular successes in the others. Fortunately, however, it often seems possible to design the components of our strategic forces to have joint products for each or many of the objectives and where conflicts appear, to design reasonable compromises. For this reason, studies of strategic forces have to consider important objectives--unless only a very specialized question is being examined.

Beyond the nine objectives we have listed, however, lie other possibilities.

We may at some future date consider it of primary importance to match a Soviet economic offensive or to outperform the Soviets in space. Moreover, our relative priorities among today's objectives may change. Thus, technological developments such as the growth of a strong independent European nuclear force may make #4 less important. Or a Soviet Union that has become more aggressive might make #4 more important. In these respects, the future is highly uncertain. Therefore, it is important that our total capability--including the research and development base--be flexible enough to accept with reasonable efficiency, increases, decreases, or major alterations in our objectives in reaction to changes in the technological, military and political environments.

Let us now consider the first five of these objectives in more detail. We should, at the outset, note that the basis of these five is "deterrence". This extreme reliance on deterrence is another great novelty of modern war, and one related, of course, to its vastly increased destructiveness. Previously, governments thought in terms of a physical ability to protect their country from the enemy's actions. The deterrent effect often associated with this ability was considered a by-product. Today, most people believe that both nations would incur catastrophic damage in an all-out war. If one believes this, then it is all-important to prevent the war from starting. There may be various ways to do this and the choices as to the means of preventing war is possibly the overriding problem of our time. It is not unduly cynical, however, to believe that at least for the present, the very dreadfulness of war implies that the best way to prevent it (short of surrender) is to convince the enemy that he will be sorry if he starts a war; that is, to deter him. Deterrence is a double concept; it describes a relationship in which one person refrains from committing a "provocation" (6) for fear of another's "response". (Schelling has pointed out that deterrence can also be described as a promise by one person not to do something if another person refrains from doing something else.) Thus deterrence can be classified in terms of the threats (promises) of response used by the deterrer, in terms of the actions which he seeks to deter, i.e., classes of provocation, or in terms of combinations of actions and responses.

The English labels "active" and "passive" reflect this last method of classifying deterrence. Passive deterrence is deterrence where the provocation brings the threat into action automatically without the intervention of any act of will. In active deterrence, however, an act of will is required to carry out the deterring threat. Some have argued that this distinction supports the distinction between attack on the "homeland" and all other provocations. The idea is that one has to use "active" threats, threats which

could not be executed without an act of will, to deter most provocations; whereas there is an automatic (passive) threat of retaliation against an attack on the "homeland" because presumably one automatically--without an act of will--retaliates against an attack on one's "homeland".

It is true, of course, that the threat of that retaliation is especially credible in relation to an attack on the "homeland" because after such an attack there may be little reason for the defender to hold back his forces. However, unless one adopts the notions of inflexible command and control and automatic triggering and disregards all the concepts of controlled war, the belief in passive deterrence is not completely appropriate even to an attack on the homeland. There are so many possible responses to various attacks on the homeland that it is (or should be) impossible to call them all automatic. Indeed there seem to be many plausible cases in which an attacker could hope to deter or intimidate us into limiting our responses even to an attack on our homeland (and vice versa). Furthermore, it is inaccurate to regard deterrence of provocations as necessarily being "active" since the problems of escalation and accidental war during periods of heightened tension require one to consider the possibility of full scale war occurring even without any very deliberate decision to go to war.

Even the conceptually simpler classifications of deterrence by kinds of response or provocation are made somewhat more complex because these usually lie in several spectra.⁽⁷⁾ Different people will choose to divide these at different places and there will often be ambiguity concerning the places of division.

In the classification of our national strategic objectives we have chosen a five-fold division of our deterrence objectives, based upon the provocation we wish to deter. An escalation ladder similar to the one discussed in detail in this chapter, can easily be adapted to yield another, more detailed breakdown of the provocations we wish to deter. Many of these are not contained in our five-fold division, while others are subdivisions of various of the categories we have used. Nonetheless, for the sake of simplicity our primary concern at this point will be the five strategic objectives we have previously mentioned.

An Escalation Ladder

A Generalized (Or Abstract) Scenario

Aftermaths

- | | |
|---|--|
| "Central War" | 25. Some Other Kind of General War |
| | 24. Limited Strategic Attacks on Population |
| | 23. Counterforce-plus-Avoidance Attack |
| | 22. A Partial Disarming Attack |
| | 21. Formal Declaration of War |
| | 20. Complete Evacuation (~ 95%) |
| | 19. Limited Strategic Attacks Against Property |
| Intense Crisis
(Bizarre Rungs) | 18. Low-Level Strategic Counterforce Attack |
| | 17. Evacuation (~ 70%) |
| | 16. Maneuvers which Seriously Degrade Enemy's Defenses |
| | 15. "Justifiable" Counterforce Attack |
| | 14. Limited (Tactical) Nuclear War |
| | 13. Spectacular Show of Force |
| | 12. Super-ready Status |
| Crisis
(Traditional Rungs) | 11. Limited Evacuation (~ 20%) |
| | 10. Nuclear War Becomes Credible |
| | 9. Conventional War |
| | 8. Limited Military Confrontations |
| | 7. Harrassing Acts of Violence |
| | 6. "Legal" Harrassment |
| | 5. Modest Mobilization |
| 4. Show of Force | |
| 3. Political, Economic and Diplomatic Gestures | |
| 2. Hardening of Positions - Confrontations of Wills | |
| 1. Ostensible Crisis | |

Specific Subcrisis Disagreement--Cold War

B. Provocations

1. Deterrence of All-Out Countervalue Element Attack on the U.S.

Our military forces attempt to deter deliberate, direct, and full-scale countervalue element attacks on the United States by trying to influence an enemy's calculation of the relative disadvantages to himself of attacking versus not attacking.

Deterrence is in part a psychological matter. It rests on the enemy's judgment of the likelihood of various possible outcomes of his attack on the U.S. For this reason, we must be interested not only in the objective capability of our systems, but also in how they appear to the enemy. Theoretically, of course, the mere facade of a retaliatory force would be sufficient if the enemy believed it adequate. Unfortunately, however, in an open society or perhaps any society there would be no reliable way to convince the enemy by a gigantic bluff without some degree of the necessary military capability. Moreover, such an attempt might be too dangerous even if it were likely to succeed, since not only would we be left at least partially defenseless if we were discovered, but we could never be certain that we had not already been found out. Such uncertainty could be disastrous in a crisis.

We therefore wish to maintain a military posture so that the enemy's calculations, whether they are made explicitly or intuitively, will show that in all circumstances this type of an attack on the United States would be clearly irrational--that it would result in too high a probability of an unacceptable amount of retaliatory damage being caused to some or all of the attacker's population, industry, or military forces. It may therefore be necessary for us to convince the Soviets of our ability to strike back even after a Soviet attack carefully designed to destroy our retaliatory forces and after their carrying out other measures to counter our retaliation. This type of deterrence may be difficult to achieve. In thermonuclear war there are many asymmetries which, in a paper calculation, and perhaps in the decision-maker's mind, could favor a decision to attack. Thus our ability to deter depends on the Soviet's estimate of what happens when they strike at a time and with tactics of their own choosing, and when we attempt to strike back with a damaged and perhaps uncoordinated force which must, in part, operate in the post-attack environment and in the face of possible blackmail threats to intimidate us into limiting our reprisal. Moreover, the Soviet defenses presumably would be completely alerted. If the strike has been preceded by a period of tension, their active defense forces may have been augmented and their cities at least partially evacuated. Each of these factors may act to increase considerably the difficulty of assuring retaliation adequate to deter.

In addition the problem of assuring even the attempt to retaliate must be viewed as a whole. It is not merely a problem of having large numbers of vehicles before the attack, or even of assuring the survival of a whole system in a broad sense, as well as of all its vital parts. To assure a decision to retaliate, we must have the legal (presidential?) decision-making machinery, vital military personnel, enough military command and control to execute an appropriate operation, and finally the resolution to carry through an adequate retaliation.

In judging our capability to do all the above--even as a deterrent--we must do much more than merely prevent a cautious and responsible Soviet decision-maker, who expects to win the cold war peacefully, from madly risking all in an attack launched in cold blood out of the blue. We want our deterrent to be powerful enough to withstand all the stresses and strains of the cold war, of sudden and unexpected crises, of possible accidents and miscalculations of optimistic gamblers or logicians who believe in paper plans, and of the tense situations in which "reciprocal fear of surprise attack" might destabilize an inadequate deterrent; we may even want to deter the irrational and the mad.⁽⁸⁾ A complete deterrent against all-out attack on the United States must provide an objective basis for a Soviet calculation that would persuade the Soviets that no matter how skillful, ingenious, or optimistic they were, and no matter how bad their other alternatives might be in some desperate crisis, an attack on the United States would lead to a very high risk, indeed to the virtual assurance of unacceptable, large-scale destruction of Soviet civil society and military forces. Needless to say, the achievement of such a deterrent without sacrificing certain other of our basic objectives--control of the arms race and prevention of accidental war--is a most difficult matter.

2. Deterrence of Limited Strategic Attacks Against U.S.

The second type of provocation which we wish to deter is in a much newer and less discussed area, that of controlled war. Attention has recently been paid to the analysis of a very specialized use of nuclear weapons which is called limited strategic attack. In a limited strategic strike, one makes a very limited countervalue attack upon the opponent. The purpose of this is not to force one's will on the enemy as a direct result of the military operations--that is, by destroying the greater part of his forces and/or population. Rather, one inflicts a very controlled punishment and by making this demonstration hopes for force one's will upon the other side or, putting it less starkly, to persuade him to accept a "reasonable" settlement.

These current and somewhat bizarre-sounding concepts have been discussed in many variations--notably by Szilard, Kaplan, and Schelling.⁽⁹⁾ In one of its simplest but most extreme forms, a limited strategic attack strategy could involve the destruction by the Soviets of a single American city every other day and the consequent retaliatory destruction of an equivalent Soviet city. This exchange could be initiated by the Soviets to obtain some political result which they might feel unattainable by less violent means and would rely upon the threat of escalation to diminish retaliation. That is, the nation beginning a limited strategic attack must feel that its deterrence of much more violent retaliatory attacks is sufficiently strong. This would of course be the case where each side had an invulnerable force capable of overkilling the other. The limited strategic attack is thought of as a last-ditch alternative to initiating an all-out thermonuclear war. In evaluating the concept, the reader will find it less bizarre if he compares it to the mutual homicide alternative and not to ordinary diplomatic reprisals or even to a limited nuclear war. In any event, the limited strategic strike can involve a serious danger of accidental war, the infliction and suffering of great costs and a naked contest of wills which militates against any long run stability. We therefore wish to deter the Soviets from this type of conduct or even less bizarre versions.

The general idea of the limited strategic strike has a variation not involving such great costs. This is the use of a nuclear weapon to demonstrate resolve. For example, if there were an uprising in East Germany and the NATO countries sent troops, the Russians might use a single small (10 KT) airburst nuclear weapon on a relatively innocuous target, such as a railroad bridge, in the United States. This would demonstrate more clearly than any threats or ultimatums that they would go very far indeed, even risking all-out thermonuclear war, to prevent a successful invasion of East Germany. It would then be up to us to back down, to negotiate, to threaten retaliation (with all the worries of Soviet escalation that such retaliation would bring), or to raise the stakes ourselves. It is precisely because there is no natural dividing line, once nuclear weapons have been used, that the use of a single nuclear weapon is so frightening. In effect, one side is saying to the other, "You had better back down, because I will not." This is a variation of the well-known game of "chicken." We wish to be able to deter the Soviets from engaging in this extremely dangerous behavior.

3. Deterrence of Controlled Counterforce Actions Against the U.S.

The next provocation to be deterred is the controlled counterforce action, another variety of controlled war. In this action, as in the limited strategic retaliation, we are dealing with a carefully controlled war whose major purpose is to change the effective

balance of power so that one can force one's will upon the enemy or, differently stated, strengthen one's bargaining position. In this type of controlled war, however, the initiator is not only trying to demonstrate his will but also to decrease the restraints on him of the balance of terror by destroying the opposing forces. Again no nation would undertake this type of operation unless it were confident of the effectiveness of its deterrence against a massive countervalue attack or a limited strategic strike of such proportions that it would force the other side to give up the counter-value reprisal attack. The controlled counterforce attack may then be extremely valuable in coercing suffering rapid attrition, it may become very clear to him that he must make the best terms available.

This concept of controlled counterforce is in a sense continuous all the way from the destruction of one soft missile site or Polaris submarine per day to a complete all-out counterforce or counterforce-plus-avoidance attack. In each of these the purpose is to put bargaining pressure on the opponent by threatening him with approaching or current defenselessness or at least a significant decrease in his threat. It should be noted that although conceptually distinct from the limited strategic strike, the controlled counterforce operation may not be so different in practice. In both cases the object of the strike will have value to the defender and this in itself will bring pressure to reach an agreement as well as forcibly demonstrate the committal of his opponent.

4. Deterrence of Attacks Upon Vital Interests

The next provocation to be deterred is a massive attack, either conventional or nuclear, upon a vital American interest, though not one previously discussed. (By vital, we mean more than merely important.) To illustrate the importance of deterring these provocations, imagine a state of the world in which the United States and Russia could each be absolutely confident that there would be no direct nuclear attack either large-scale or by a limited strategic strike or controlled counterforce operation by the other for some fixed period--say, ten years. Such a state of affairs might obtain through a firm non-aggression pact or an enforced arms control agreement.⁽¹⁰⁾ It might also obtain if each side possessed an invulnerable retaliatory force capable of destroying the other's unprotected civil society and set to be automatically triggered if the homeland were attacked. It does not take much imagination or a dim view of Soviet behavior to see that there would then be a grave risk of their taking over Europe, Asia, Africa, etc., during this period, either one at a time or almost simultaneously. Before the balance of terror had changed, the U.S. might be too badly out-matched to compete either economically or militarily with the new Soviet Union. It is not obvious that the Russians would actually try to do this or that they would succeed if they tried. However, it obviously is a serious possibility, which we seek to prevent.

The question of course arises, why do we have to rely on deterrence in this area? Will not old-fashioned defense do? And indeed it is believed by many that we should not need to rely on nuclear deterrence to be able to meet attacks with conventional weapons. The six countries of Euratom and the Common Market by themselves possess economic and population resources (and therefore potentially military resources) almost equal to those of the Soviet Union. While their actual industrial product and population are slightly less, their average skill in military and technical matters might more than compensate for the slight disparity. If England is added to the six Euratom nations, then the balance is against the Soviets in terms of both population and economic resources. The Soviets are ahead of this "bloc" only in military forces in existence, not in potential military capability. If there really were assurance that no nuclear war would break out between the U.S. and Russia, then the Euratom nations would have great incentive to form a real bloc and to try to build an adequate defense of their own against the Russians. They might even succeed--especially if we helped them. The history of NATO suggests, however, that they would probably fail, unless Russia went out of its way to inspire them by being simultaneously provocative and patient--provocative so that the Europeans would be sharply motivated, patient so that they would have the time they need to carry through a drastic rearmament and political realignment. The real weakness of this Euratom bloc lies in the inability of the member governments to induce their citizens to make economic and personal sacrifices comparable to those that the Soviet government routinely expects from its citizens. Moreover, the U.S., too, appears unwilling to make the necessary sacrifices to develop a conventional force capable of defending Western Europe against the Soviets. Hence we must rely, at least in part, on deterrence. We will discuss later the possible means of deterring attack on these vital interests.

5. Deterrence of Lesser Provocation

The last type of provocation to be deterred is an event that is by definition much less provoking, or provoking in a much less important area, than the four already mentioned.

Although deterrence of a particular example of this type of provocation is less important than deterrence of much more serious provocations, the number of challenges in this area is so large that to a great extent this category includes a large fraction of the total foreign and military policy problems we face today. We are here more concerned with the other provocations to be deterred not because they are more likely--which they are not--but because comparatively little attention has been paid to them and because they have the capability of being more destructive. It is also in the other areas that civil defense plays a most important role.

Typical past examples of "lesser" provocations would be Russian interference in Hungary, Korea, and Southeast Asia; the threat of Chinese attack on Formosa; a program of espionage; and possibly even the threatening Soviet notes to our allies. Other such provocations might be attacks upon Iran, Berlin blockades, and pressures in Afganistan and Pakistan. It is important to deter these provocations both to facilitate other of our objectives as well as to avoid "salami" tactics, but few would seriously urge threatening an all-out war as a proper method either of deterring or avenging them. Indeed while we may try to deter these relatively minor provocations by various means and may even succeed to a certain extent, deterrence cannot be our only weapon. Occassionally, we must be willing to reply to this type of provocation with capabilities on the spot or to accept them, i.e., we cannot expect to deter all lesser provocations.

C. Means of Deterrence

There are various methods designed to accomplish the deterrence of the five types of provocations we have discussed. These "responses" include foreign trade, propaganda, foreign aid, the formation of alliances, and the support in various ways of governments we feel are friendly to us. If we focus, however, on military means, we discover that the deterring threats or responses, like the provocations, form a spectrum which can be divided into five major threats.

1. All-out countervalue-element attack on the Soviet Union.
2. Limited strategic retaliation against the Soviet Union.
3. Controlled counterforce action by the U.S. against the Soviet Union.
4. Waging of limited war in appropriate areas.
5. Some degree of mobilization--purchase of increased capabilities, creation of alliances, etc.

We should point out that a means of deterrence does not have to threaten a 100% certain retribution for a provocation in order to be an effective deterrent in most situations. In fact, the probability of an extremely unpleasant punishment may not have to be high at all to restrain a cautious decision-maker. It is only in crisis situations where a decision maker's desperation may lead him to over-optimism or where other forces impel him toward the provocation (see Chapter II) that we will need a reasonably high probability of the punishment to be deterring.

Moreover, we should also distinguish between the deterrent value to us of certain threats and the disadvantages to us of actually carrying them out. A threat such as that of all-out nuclear attack involves such serious consequences to the enemy that even if its probability is low it would serve to deter. On the other hand, it would be so costly to us and to the world if we carried it out that even if it had great deterrent value, it might be too dangerous for us to commit ourselves to the use of such a means in situations where the committal was likely to be "called." This principle, of course, interacts with the deterrent value to us of the threat. It will usually be difficult to convince the enemy that we would actually carry out so serious a threat should he commit a provocation and thus the deterrent value of the threat will be lessened. The classic example of this effect was the demise of our policy of "massive retaliation." Once the probable cost to us of launching a major nuclear attack on the Soviet Union became high, our threat to do so over a minor provocation became incredible and hence not deterring--except, of course, to the extent that a Soviet decision-maker might not wish to take even a small chance of such an eventuality.

1. Deterrence by Threat of Countervalue Element Attack on the Soviet Union

The first means of deterrence involves the threat of some type of avoidable countervalue damage in an all-out nuclear attack upon the Soviet Union. This means of deterrence in theory could be used to deter any kind of provocation. Unfortunately, except for the most major transgressions, the threat would not be credible. No one would believe that the United States would take a high risk of tens of millions of casualties to redress, for example, an attack upon Laos. Moreover, even where a large-scale nuclear attack has been launched at the U.S., this type of retaliation might not be appropriate. A large-scale attack of the counterforce or counterforce-plus-avoidance type is designed to deter any countervalue response and thus the targeting of the retaliation can have a complicated relationship to the success of the attack. Even if the initial attack on the U.S. contains countervalue elements, a similar response may or may not be justified, depending on the strength and invulnerability of our remaining forces as opposed to those of the Soviets. Although it does, of course, have other disadvantages, an inflexible command and control with automatic countervalue response⁽¹¹⁾ would be one of the most effective ways of deterring this type of Soviet attack. For other types of provocations some other response could be a more satisfactory deterrent than all-out countervalue element response.

2. Deterrence by Threat of Limited Strategic Attack

The next means of deterrence also corresponds to a behavior that we are anxious to deter. It is deterrence by means of the threat of a limited strategic attack. This type of controlled war might envisage the destruction of a countervalue target (possibly a city but more likely a gaseous diffusion plant or a dam) in order to retaliate for some provocation or even the continued "one per day" destruction of valuable targets until the provocation had ceased. While it would comprehend the use of nuclear weapons against the enemy's territory, it would do this in far fewer numbers than the previous threat. This means does not appear appropriate to the deterrence of a large-scale countervalue attack since it is unreasonable to assume that the United States would plan to reply to a massive Soviet attack on the continental U.S. by less than a corresponding large assault. Nor would a limited strategic retaliation seem so appropriate a threat to control the more minor provocations since it may involve severe damage as well as the danger of escalation. Nonetheless, in the context of the balance of terror or the near balance of terror, deterrence by means of the threat of this naked contest of wills needs to be considered.

3. Deterrence by Counterforce Attack

Deterrence by means of controlled counterforce action against the Soviet Union so long as we retain a strategic superiority may be a more useful means of deterrence than the two previously mentioned. This is so because it not only is a relatively violent and effective punishment (especially where defense capability may be valued more highly than people) but because this, under some circumstances, might be both less costly and risky and yet more effective in promoting our objectives and hence more credible than the previous threats. Unlike the limited strategic retaliation, it is not a mere naked contest of wills which places a premium on irrationality or at least the appearance of irrationality. Rather, the "settlement" should reflect both the continuing resolve on both sides and the balance of power; the side which is weaker or closer to losing its retaliatory capability accepting some degree of defeat or retreat. Moreover, should this type of action subsequently degenerate into a countervalue war, it is likely that the civil destruction would be much less due to prior attrition of the forces of both sides. The controlled counterforce is most effective militarily where no true balance of terror⁽¹²⁾ exists--that is, where at least one side does not have a second strike overkill capability. In this situation, the faster the counterforce action is performed, the less likely would be the resort to limited strategic retaliation as a method of countering it. In the extreme case of a disarming strike, a credible threat might be made to counter any subsequent strategic retaliation than with, say, a five-to-one destruction ratio or a large-scale countervalue attack. It should be noted that at least for the early sixties we expect to have an asymmetric ability to engage in controlled counterforce actions, in part

because of our larger number of hardened missiles. As long as no firm balance of terror exists, we may be able to rely partly on our threat of a controlled counterforce operation to deter both Soviet limited strategic retaliation and controlled counterforce actions. Moreover, both before and after a firm balance of terror comes into being, attacks on our more vital interests (as well as some of the more important of our less than vital interests, such as Iran, Turkey, etc.) may be deterred by Soviet fear that we might, perhaps, begin a controlled counterforce action.

4. Deterrence by Threat of Limited War

The next means of deterrence is through the threat of limited or sublimited war. This means involves not only deterrence but defense in the traditional sense. Although it has been suggested by many that we rely on this means in one form or another (nuclear or non-nuclear) to deter all provocations short of an attack on the U.S., it is difficult to see how any such threat would be effectively deterring in many extreme situations. This is particularly true of the deterrence of attacks in Europe. Admittedly, there are certain questions about the actual ability of the Warsaw Pact nations to undertake a successful offensive in Western Europe that might cause them to consider the matter carefully. Nonetheless, were there no threat of central nuclear war involved, whether through deliberate action on our part or through escalation, the Soviet Union might as well weigh the damage that they would suffer in case of failure against the possible value and chance of success and decide to go ahead with the operation. In particular, a complete reliance on non-nuclear deterrence in this area would release the Soviet Union from many pressures toward arms control and even provide an incentive for them to be careless with their use of power in these areas. Nonetheless, in areas not directly adjacent to the Communist heartland, this type of deterrence can be quite effective, since at least in some of these areas we appear to be able to summon up as much limited war capability as the Soviets. To protect other areas, such as Finland, Afghanistan, or Iran, we must rely on the dangers of escalation, residual fear of the all-out or controlled war, other political consequences, or deterrence by threat of mobilization.

5. Deterrence by Threat of Mobilization

Deterrence by means of threat of mobilization (also called deterrence by threat of increased capability) does not involve the direct and immediate threat of any type of military action against the Soviets. Rather, it comprehends certain measures toward the purchase of various capabilities which could be regarded as an increased degree of mobilization. This would involve increased defense budgets and serious civil defense efforts which might in crisis situations make more feasible an

attack upon the Soviet Union, most likely by means of some type of controlled war, and which increase our ability in some sense to win such a war. Moreover, the purchase of such a capability would throw a great economic strain upon the Soviets if they undertook to neutralize these moves. Although it should be remembered that civil defense is primarily an insurance measure, in some circumstances it can be a major part of this means of deterrence and, thus, affects our entire deterrent posture.

For an example of how this deterrence by means of the threat to purchase increased capabilities might work, consider the following scenario taken from Herman Kahn, Thinking About the Unthinkable; Horizon Press, 1962:

Our scene starts at a new summit meeting between the East and West. There has been a party the first evening, and Khrushchev may have gotten more than slightly drunk. One cannot be sure whether he actually has drunk too much, or whether he is relying on the fact that we will forgive a drunk man for saying certain things which if said by a sober man would arouse our utmost resistance. Khrushchev gets Kennedy off into a room for a private chat. He starts by describing the arms race. Recent Soviet experiments have convinced Khrushchev it is possible to build gigaton bombs (a gigaton is a thousand megatons). He believes the Chinese are working on the technology of ordinary atomic and thermonuclear bombs but it is clear they will soon progress to larger devices. Studies by Soviet scientists have also convinced Khrushchev that in the not-too-distant future it will be possible for many nations to build doomsday machines. In fact, they may be so cheap and simple that even small or relatively backward nations will be able to build them. He is also fearful of the widespread diffusion of simple inexpensive missiles with warheads. It is absolutely essential that the arms race be stopped or at least controlled. Khrushchev points out that it is impossible for him to be conciliatory any longer or even to cooperate in the most essential arms control measures so long as we keep Berlin--the bone in his throat--as a live issue. He points out that despite enormous internal opposition, he has been incredibly conciliatory; he had committed his prestige as long ago as November 1958 and had been willing to live with setback after setback, enduring the jibes and scorn of his own staff and colleagues in order to try to settle the crisis peacefully. He points out an American president, Eisenhower, had admitted that Berlin was an abnormal situation which had to be settled; and that all talk of settling the crisis by means of German reunification was dangerous nonsense.

He continues with a detailed description of how he expects to take over Berlin. He asserts that he can do it safely; he knows that we will make all kinds of empty threats, but he does not care. He cannot believe that we will start an all-out war which would simply result in the mutual destruction of the Soviet Union and the United States; lesser threats and actions he can handle on the spot. He then offers several "If you do this, I will do that" type scenarios which illustrate the strength of his position. He summarizes by saying he is entitled to Berlin, intends to get Berlin, and will get Berlin--the only question is how. If we settle this problem peacefully, he will be glad, as a voluntary, conciliatory gesture, to give us guarantees for our vital interests (as opposed to the unreasonable demands we have been unrealistically pushing), and then both nations can get on to the more important problem of controlling the arms race. If we are not willing to be reasonable, then he will be forced, much against his will, to inflict a most humiliating defeat on us--a defeat which he would, in the interests of international amity, rather have spared us.

Now Kennedy has many possible answers to Khrushchev. He can assert that he is willing to initiate a limited war and expects to win it. He doubts that Khrushchev would be willing to let it escalate or be dragged out. He can assert that if necessary the United States could attack the Soviet Union and survive even an all-out malevolent Soviet retaliation. In such a war, only the Soviet Union would be destroyed; the United States would be severely damaged, but would recover. He can point out that an all-out attack might be even less risky than Khrushchev now thinks, because the U.S. might use post-attack blackmail tactics and they might work. He knows Khrushchev will not agree, but he also believes that Khrushchev will change his mind when it comes to the "moment of truth" when he must choose between the end of the Soviet Union and a compromise peace. Finally, he can point out that if the U.S. does not resort to either of the first two alternatives, the U.S. will then be in serious trouble. The NATO alliance will have been strained to the breaking point. In order to preserve it, the U.S. will have to prove that it has both the resolve and the capability so that another such humiliation will not occur again.

He can refer back to the Korean situation of 1950 and point out that this has happened before; that during 1950 there was a "great debate" in the United States as to whether the defense budget should be 14, 15, or 16 billion dollars. In June, the North Koreans invaded South Korea, the Americans suffered some humiliating defeats, began to fear for their

world position, and that year the Congress authorized 60 billion dollars, an increase by a factor of four over what would have been authorized. This time, if the Soviets inflicted an even more humiliating defeat, the least we would do would be to increase our budget by a factor of two and maybe a factor of four. We could afford to do it. World War II showed that we could spend more than 40 per cent of our GNP for military products without suffering any severe hardships. Under current economic conditions, this would mean that more than 250 billion dollars annually could be spent on military products; that with such spending or even a fraction of it, we would be able to buy adequate limited war forces--both for ourselves and our allies--so that we could fight limited wars on any level and win them. Moreover, we could buy central war forces, including adequate active and passive defense, so that we would unquestionably survive an all-out war.

Finally, Kennedy can repeat that the above is the least that the U.S. would do. It might take other actions in addition. He realizes, of course, that the Soviets could attempt to carry through countermeasures. In particular:

(1) They could strike the United States before the build-up got very far. This might look very unattractive, especially since the build-up would almost certainly be accompanied by an increased alert and other measures to reduce the vulnerability of U.S. and NATO retaliatory forces.

(2) They could try to restore the balance. To the extent that they did, it would mean that their aggression had at length cost them tens of billions of dollars annually. However, because of lesser Soviet resources, they would inevitably fall short to some degree. In that case,

(3) they could accept some degree of inferiority. Such an acceptance might have serious consequences. The United States would have a "fight the war" capability as well as a "deter the war" capability. In addition we would be angry--at least for a while. This would mean not only that they could not afford to challenge us again but that even a relatively slight and unintended incident could result in a blow-up.

In short we could threaten an acceleration of the arms race. This would be dangerous to both of us but it would be substantially more dangerous to the Soviets than to us. It would also at least seem less dangerous than an

Immediate attack. Therefore, it should be credible to the Soviets that if they changed the international situation so that the competitive aspects overwhelmed those of mutual interest, we would actually be willing to touch off an accelerated arms race. This threat could be a most persuasive and effective deterrent to provocation. It would also make a great deal of sense for the U.S. to be prepared to implement it. We could, for example, spend modest sums of money today and make other preparations, so that we could rapidly divert our great GNP to military preparation. Such a diversion, if carried out, would greatly accelerate the arms race, and thus be mutually dangerous. However, part of its value as a deterrent would come from this mutual danger and part from the fact that, at least temporarily, it would be more dangerous to the Soviets than to us. In any case, such an acceleration of the arms race, dangerous as it is, could still be less dangerous than either an attack or an accommodation.

President Kennedy could then continue with any offers of his own on Berlin.

This means of deterrence is based on a number of threats: first, to cause the Soviets great expense by forcing them to match or otherwise neutralize the advantage we will have gained from our increased expenditures; second, to make our use of the other means of deterrence more likely in the future because, insofar as we have gained an advantage from our expenditures, the Soviets may fear it more likely that we will subsequently either indulge in provocative behavior ourselves, or issue an ultimatum to undo their previous provocation; and, finally, to contribute to the arms race, thus increasing the danger of accidental war, weakening the balance of terror and causing general destabilization. It would seem that this threat which in effect tells the Soviets they will be sorry if they make us angry is an effective one in a wide range of foreign policy situations and, in fact, in most of the "medium extreme" situations we are likely to encounter.

The second major facet of this means of deterrence arises from the fact that it is not only a threat but upon failure becomes the purchase of a capacity. This capacity may vary greatly, in degree or in kind, and can be changed with relative ease. Thus, this means of deterrence has a degree of flexibility denied to deterrence by threat of massive attack, controlled war, or limited war. To see why this should be so, imagine that each means of deterrence fails and consider the consequences of having to make good our threats. A massive countervalue element attack can be used just once at a cost of enormous damage to both sides. A controlled war may not only do great damage but is also very likely to

escalate into an all-out war. To a lesser extent a limited war may escalate, and in addition it may have the added disadvantage or advantage of leading to a situation in which there will be a definite winner and loser. Insofar as we are the loser not only will we have lost the area we fought for, but our world-wide prestige might be severely damaged and our other commitments rendered more suspect. Should our threat to purchase increased capabilities fail to deter, we must merely purchase a capacity which may stand us in good stead later. Moreover, although this type of deterrence is expensive in materials, it generally is not in lives. Furthermore, in operation it can easily be increased and decreased as the provocations vary. The following threats have deterrent values of increasing magnitude:

1. Increase our defense expenditures and gain a modest C.D. capability.
2. Gain an excellent C.D. capability.
3. Invoke C.D. protective action.

It should be noted that deterrence by means of increased capability is really shorthand for a large number of programs. This use of one term should not obscure the fact that the accentuation of different kinds of capability may have very different effects upon our deterrence of attack on the homeland, limited strategic retaliation, controlled counterforce attack, attack on a vital interest, or a more minor provocation. In addition, different kinds of capability will have different effects upon our ability to use the various means of deterrence including even further increases in capability. Variations in the use of deterrence by means of increased capabilities, in this respect, can, with great flexibility, raise different types of deterrents by differing amounts, have different effects upon our allies, the Soviets, and the Neutrals, and leave us in a very different posture with respect to our war-fighting ability and certain other of our national goals.

The Deterrence Diagram

Since the concept of deterrence involves the matching of a provocation with threats or means of deterrence, the whole range of provocations and means may be paired by arranging them in a matrix where the provocations are set out in a column and the means of deterrence in a row. We will call this matrix a deterrence diagram (see Figure 1). Of course, it should be remembered that our ability to deter any one provocation is composed of our ability to deter it by each of the means available to us. And indeed, the actual decision-maker contemplating a provocation must make a judgment not only of how effective and serious the carrying out of any deterring threat would be to him but also how likely we would be to carry out that threat. In addition, the likelihood of our carrying out any threat would be dependent in great part on his ability to deter our response. In fact, this reasoning can be carried to further degrees of complexity by observing that the decision-maker

Figure 1

	1	2	3	4	5
Threat or means of deterrence	All-out counter-value-element Attack on the Soviet Union	Limited Strategic retaliation against the Soviet Union	Controlled counterforce action against the Soviet Union	Limited war	Purchasing increased war-fighting capability
Possible Provocation					
All-out counter-value-element attacks on U.S.	Part of Kahn's Type One Deterrence. This is the deterrent underlying our "Save the cities" strategy	An extreme finite deterrence position urged by some unclear semi-pacifists	Preferable where countervalue-elements are not too prominent and have sufficient strategic superiority	Some nuclear pacifists would defend the U.S. through guerrilla warfare	Empty
Limited strategic strike against U.S.	Soviets would fear most but not so credible as a counterforce attack	The city trading idea. Deterrent unless the Soviets believe we cannot keep it up long or exact a sufficient price.	A likely reply and in many cases the preferable one	Not available to U.S. (Cuba) but reverse available to Soviets (Western Europe)	A stronger deterrent than many realize since even if the Soviets were not deterred by other means they might fear a vastly increased arms race
Controlled counter-force war against the U.S.	The provocation is designed to deter any countervalue retaliation. We should be able to accept this restriction so long as we have strategic superiority	May be effective as deterrent while we have strategic superiority, but controlled counterforce would be better if deterrence failed	Current doctrine of controlled war	Not available to U.S.	Reasonable provided peace terms if attack were successful would not take away our ability
Full-scale nuclear or conventional attack on a vital U.S. interest	This is rapidly becoming no longer credible. Controlled counterforce is more credible and hence deterring	May be effective as deterrent but a controlled counterforce if deterrence failed might be less destabilizing	Credible if we have controlled war ability, civil defense, etc.	We may lack capability in Western Europe	Useful for the next 5-10 years
Attack on a less vital U.S. Interest	Not at all credible. Part of "Massive Retaliation" doctrine	Not credible since too likely to escalate	Too dangerous and therefore not very credible	Our present policy--Korea	Valuable for "Indefensible" areas--Berlin

contemplating a provocation must also consider our ability to deter him from any response by which he would seek to deter our response to his provocation and so on. Despite this, the deterrence diagram is valuable here since it is a degree of complexity beyond the more simple analyses involving Type I, Type II, and Type III deterrence,⁽¹³⁾ yet without making necessary the complexity of a scenario or a single or double escalation ladder. Even so, a deterrence diagram could become very complex, since if we considered ten possible provocations and ten means of deterrence, we would then have 100 pairs to examine. Of course, some of the pairs would be so unrealistic that they could be ignored. The provocation could be so mild and the threat so mutually dangerous that it would not be credible and for that reason not deterring, or the threat might be so mild that it could not hope to deter a serious provocation. Nonetheless, a 10 x 10 deterrence diagram is too lengthy for discussion here and we will, therefore, use a 5 x 5 diagram,⁽¹⁴⁾ pairing the five types of provocation with the five major means of deterrence we have already discussed.

Notice that the means of deterrence are roughly similar to the provocation to be deterred. This is so because one side's potential provocation is often another's means of deterrence. The differences here are the result of leaving out some rows and columns we consider less important than those included. Thus a Russian threat of increasing their capability is not so deterring to us, while they do not seem disturbed about the possibility of our attack on a less than vital Soviet interest. (Until recently, Cuba might have been thought to be an example of this principle--now this example is not so clear, though the principle is still probably generally true.) Of course, in a much more complete diagram, both of these facets of deterrence would be discussed as well as the division between conventional and nuclear attacks upon vital U.S. interests.

The deterrence diagram, although helpful, gives a misleadingly static view of the strategic situation. When account must be taken of the differing levels of deterring possible responses to one's own provocation and deterring the deterrence of these responses, the more complicated problems of international bargaining become relevant. Moreover, the deterrence diagram tends to treat the deterrence of most provocations as all or nothing situations where the provocation comes out of the blue. This, of course, will most likely not be the case. The provocation cannot be expected to be so stark as we have discussed. Most likely Soviet action will be through a proxy--East Germany may attack West Germany or in response to an actual or feigned provocation against Soviet interests where the Soviets may be said to have at least a shadow of a claim. Thus the deterrence diagram is not completely adaptable to crises situations where the previous positions of both parties have made the provocation a relatively smaller step from the previous situation and have greatly increased the pressures on one side toward committing the provocation.

Lastly, the deterrence diagram does not reflect the problems caused by the manipulation of the threat of accidental war. The importance of showing committal in crises and the possibility of actual committal through burning one's bridges. It is only when we consider such things as the escalation ladder at greater length than is appropriate here that these factors are brought into proper perspective.

NOTES

1. In the countervalue attack the attacker tries to destroy those things which the defender prizes most highly regardless of whether such destruction helps the attacker to achieve an immediate or essential military objective. Presumably, nations prize people and property most highly. Therefore, the most likely countervalue attack would be made against the cities which contain the greatest concentrations of people and property in a manner designed to cause the greatest possible number of deaths and injuries and handicaps to recuperation. For example, an attacker might deliberately attempt to achieve massive blast and thermal effects with missiles and warheads of the highest megatonnage available.
2. The mixed counterforce and countervalue attack is an attack directed both against our strategic forces, command and control, etc., and against the things we value most highly. For example, in the counterforce-plus-bonus attack the attacker feels it desirable to destroy as much of the other side's civilian population and property as he can though not at the cost of decreasing significantly the military efficiency of an attack concentrated upon the defender's strategic forces. An attacker might want to obtain a "bonus" to foreclose any possibility of a long war, to prevent or lessen post-war competition, to be revenged, or simply to be malevolent. He might also have an obsolete doctrine, or even some reasons he could not articulate, but which might still seem sufficient to make him accept a modest decrease in military efficiency over the straight counterforce attack. To obtain a "bonus" the attacker could move the designated ground zeros slightly, use the largest workable weapons, ground-burst against soft targets, and in other ways greatly increase bonus damage to civilians and property without materially decreasing the efficiency of the counterforce operation.
3. In a controlled reprisal one would be trying not so much to destroy the enemy's military capability or people or property as to force one's will on him by threatening destruction of countervalue targets. The operations would be chosen so as to demonstrate resolve, commitment, and/or recklessness, and to frighten and harass the enemy, but not to destroy him or provoke him to suicidal desperation.
4. In the counterforce attack, whether a large-scale disarming stroke or a smaller-scale campaign of attrition, the attacker ignores the things the defenders particularly value, and concentrates on those targets that may be used to hurt him most immediately in retaliation. Reverting to fundamental and historical military principles, and reversing the trend of the most recent years, the "modern" attacker should realize that destroying the defenders' cities, factories, and

population cannot help his war effort or do much harm to that of the defenders. Unlike World Wars I and II, and in a war lasting between a few hours and a month, the defenders today are not going to manufacture anything of importance, or draft any soldiers, or even hold elections. Moreover, the potential fallout that would force the surviving civilian population to seek shelter in any event makes it more unlikely that problems of civilian morale would worry the defenders during the war. Lastly, and probably most important, the surviving civilian population may be valuable hostages in deterring retaliation and in achieving political objectives, including the enforcement of peace terms without further mass violence.

5. A doomsday machine can be defined as a device or a set of devices that, when exploded, will destroy all life in the world.
6. The word "provocation" in this context is somewhat unsatisfactory because it connotes a moral judgment which is not necessary here.
7. Since the word "spectra" implies that the variation among threats or provocations is in one dimension only, it is an inadequate description. As we shall see, the classification of threats and provocations is more complex.
8. It is sometimes stated that even an adequate deterrent of large-scale attacks on the homeland would not deter an irrational enemy. This might be true if irrationality were a go-no go proposition. Actually, irrationality is a matter of degree. In addition, if the irrationality is sufficiently bizarre, the irrational decision-maker's subordinates are likely to step in. As a result, one may want a large safety factor in this type of deterrence so as to be able to impress even the irrational and irresponsible with the need for caution.
9. See the essays edited by Klaus Knorr and Thornton Read, United Strategic War, Praeger, 1962, and sources cited there.
10. The most likely type of pact would be one renouncing the first use of nuclear weapons. Under a wide variety of circumstances, this would have some of the "bite" of a non-aggression pact between the U.S. and the Soviet Union.
11. It would, however, increase the danger of accidental war and decrease our "war fighting" ability.
12. By balance of terror we mean a situation in which both the United States and the Soviet Union could each effectively destroy the civilian society of the other regardless of which side struck first.

13. See Herman Kahn: On Thermonuclear War, Princeton University Press, 1960, especially pages 126-158, 173-179, 218-223, 282-288, and 556-564.
14. It is not necessary, of course, that the matrix be square. It is purely coincidental that the matrix we deal with here involves the same number of threats as provocations.

CHAPTER IV

SOME CIVIL DEFENSE TACTICS FOR USE IN A CRISIS SITUATION

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CHAPTER IV

SOME CIVIL DEFENSE TACTICS FOR USE IN A CRISIS SITUATION

Introduction

This chapter is concerned with civil defense programs both as insurance in the event of thermonuclear war and as a facet of deterrence by threat of increased capability. It considers a range of civil defense programs in the light of possible future crises which this country may face. A requirement of developing this point of view is the examination of the feasibility of actually constructing plans for use in possible future crises. This matter is examined in some detail in Chapter V.

One thought behind the development of crisis plans can be illustrated by the following scenario:

After a series of unprecedented crises in foreign affairs that have gradually escalated to a point of critical decision, the President of the United States, seriously contemplating the issuance of an ultimatum to the enemy, asks the Secretary of Defense, "Considering the current status of our civil defense program, what can be done within a period of seven days in order to develop a much greater capability?" The reply of the stunned Secretary of Defense at this point is a hesitant clearing of the throat.

Clearly, a more satisfactory ending to the above scenario would be a reply by the Secretary of Defense that he has a complete set of such plans in his file up to date and ready for use; he immediately requests the Assistant Secretary of Defense (OCD) to produce them.

When one visualizes or believes that any next war, should one occur, will probably follow a crisis or series of crises, then it seems appropriate that civil defense plans be geared to the implications of such circumstances. This is the basic motive of the various tactics which are outlined in this chapter and subsequently illustrated in some detail for one situation. Appendix B provides a scenario showing the development of a crisis in which plans for a crash civil defense capability would be highly desirable. A major purpose of this scenario is to provide a specific context for the development of the seven-day strategic evacuation plan of Chapter V.

Fever Charts

To help understand the relationship of civil defense to crisis planning, let us consider Figure 1, which is a hypothetical illustration of a "fever" chart. This "typical" chart is a measure of future tension which might develop in any country as a function of time. There is much to be learned through the examination of such a chart, which, in fact, is patterned after historical examples. The curve shows that crises tend to have spikes, sharp rises followed by sharp declines. The spikes probably represent complicated psychological phenomena, in part. In part, the precipitous decline reflects the fact that in a time of severe crisis, extraordinary efforts are made to obtain acceptable resolution. The psychological reaction includes influences which result from misunderstanding, or from a readiness to join a fever of "hysteria" often based on ignorance (witness the Berlin crises or response to Cuba). At other times the perceived danger may seem so small that the reaction is inadequate. (e.g. early responses to Hitler.) A crisis may not actually decrease in terms of any "objective" measurement, but with the passage of time, the fact that it does not get worse (for example, Cuba) will suggest to many that there is no real cause for alarm, and as a consequence the tension will fall. Consequently, the general nature of a fever chart is found to be one in which there are these sharp peaks and rather broad valleys (baselines) to which they decay.

It is interesting, however, to notice in a fever chart the gentle rise or fall of the general baseline. In the particular figure shown, one can see that even though the peaks decay practically down to the level at which they began there is a small rise in the baseline. The implication is that the international situation is gradually deteriorating over time, resulting in an increasing underlying anxiety from which the sharp peaks can readily spring up. The cold war, especially with nuclear technology and advanced delivery systems, has lifted the baseline for us. This fever chart also illustrates the fact that most wars have been preceded by a crisis or a series of crises which can be considered ambiguous suggestions that war might follow. This is not to say, of course, that the pattern must inevitably continue in the future--it is stating that this pattern has expressed itself in the past a great deal more frequently than the "surprise attack out of the blue."

It is quite possible, as a consequence of the receipt of such "warning" that action may be taken by civil defense authorities as well as by other segments of the government. Action which might be taken by the OCD will depend upon (a) the nature and intensity of the crisis, (b) an evaluation of the interaction between the possible alternatives and the crisis itself, and (c) upon existing C.D. plans and preparations.

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TENSION



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TIME

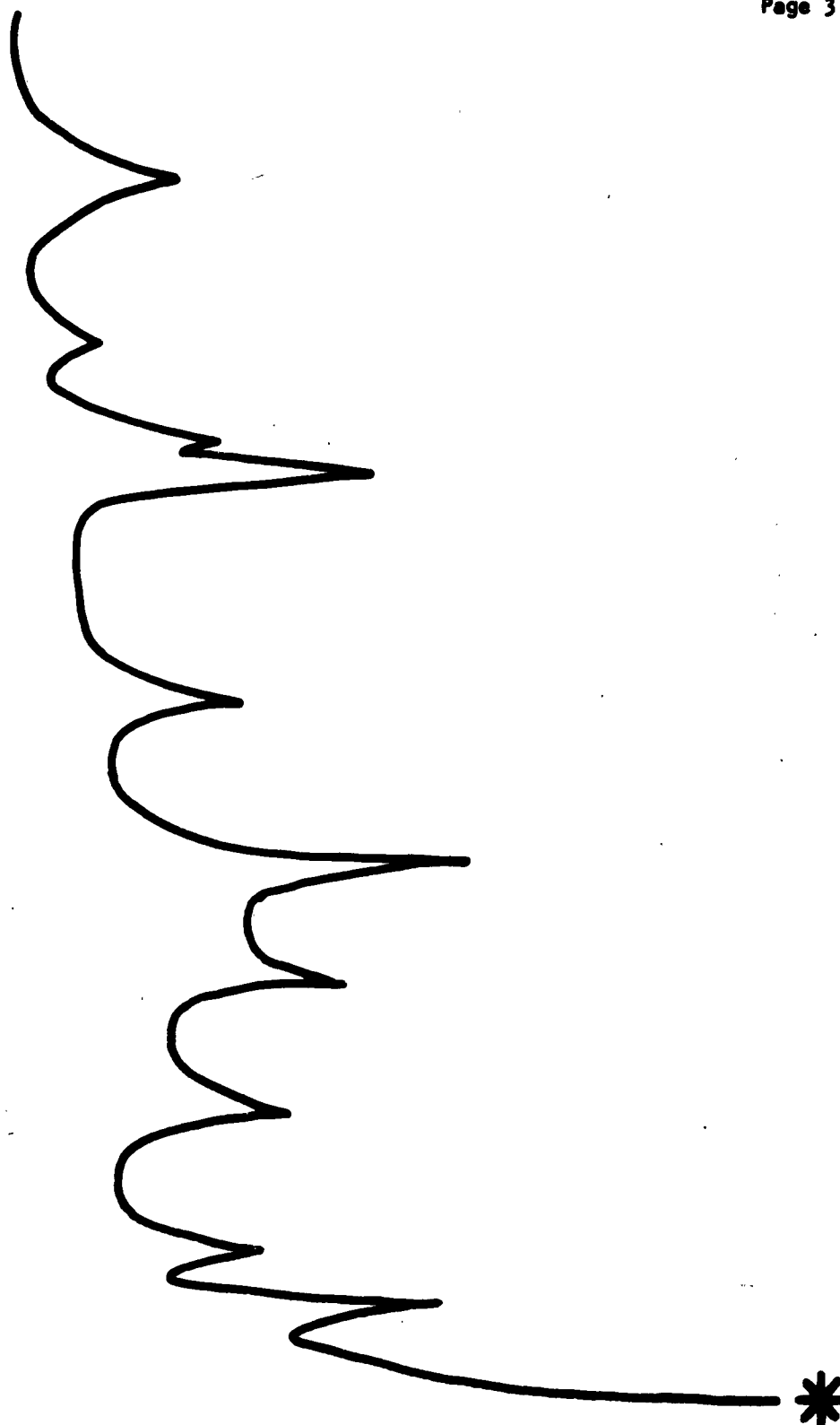


Figure 1

It is not our recommendation in this study that specific C.D. plans for possible future crises are necessarily desirable or that the action, if the plans existed, would necessarily be considered in future crises, or that, if considered, they would necessarily be implemented or, if implemented, would have a beneficial result. On the contrary, we wish to emphasize that this entire matter is in the preliminary stages of research. Our main purpose in this report is to outline the spectrum of crises which are possible, the range of alternative plans, their possible consequences, and finally, discuss the feasibility of implementation in alternative crises.

In the fever chart, it will be observed that the sharp spikes are initially drawn with a rapidly increasing slope. A detailed examination of these curves in hours, days, and weeks, would suggest that before the peak of any spike is reached one would expect some time to be available (at least judging from past crises, see Figure 2) in which some C.D. actions may be carried out before the peak of tension is reached. For those cases in which this statement is true, we can imagine that preceding a crisis there would be available time of the order of hours, days, or weeks in which various alternative civil defense actions might be taken. The importance of this statement lies in the assertion, which we make without reservation: that given some reasonable amount of advance planning (some advance planning means that ten million dollars or more has been spent on the project) during a time of severe crisis more effective civil defense capability can be obtained in two days than has been obtained as a result of all the programs which have been sponsored through the federal government's civil defense authority during the past 15 years. Now this is a startling statement to make, but we believe it to be true. The impact of the statement becomes much more consequential when we observe that for many crisis situations which could end in war there might indeed exist a strategic warning period lasting several days, weeks, or perhaps even months. We have visualized, in making the assertion above that, because of the state of tension which accompanies the crisis, the people are ready, willing, able, and indeed desirous of taking protective action and, indeed, would seek the guidance which can best come from the government as a result of advance planning. In Chapter V, an illustration is offered of one set of possible emergency civil defense tactics which can be employed in a desperate crisis, one which supposes the possibility that citizens of the northeastern area of the U.S. will have from two to thirty days to respond to an imminent nuclear attack.

Before leaving this subject, we would like to refer to figure 2, a fever chart which subjectively represents one American's view of the tension felt from European events, from Hitler's advent to power in 1933 to the outbreak of the second world war. While this fever chart is subjective, as any one of them must be, nevertheless,

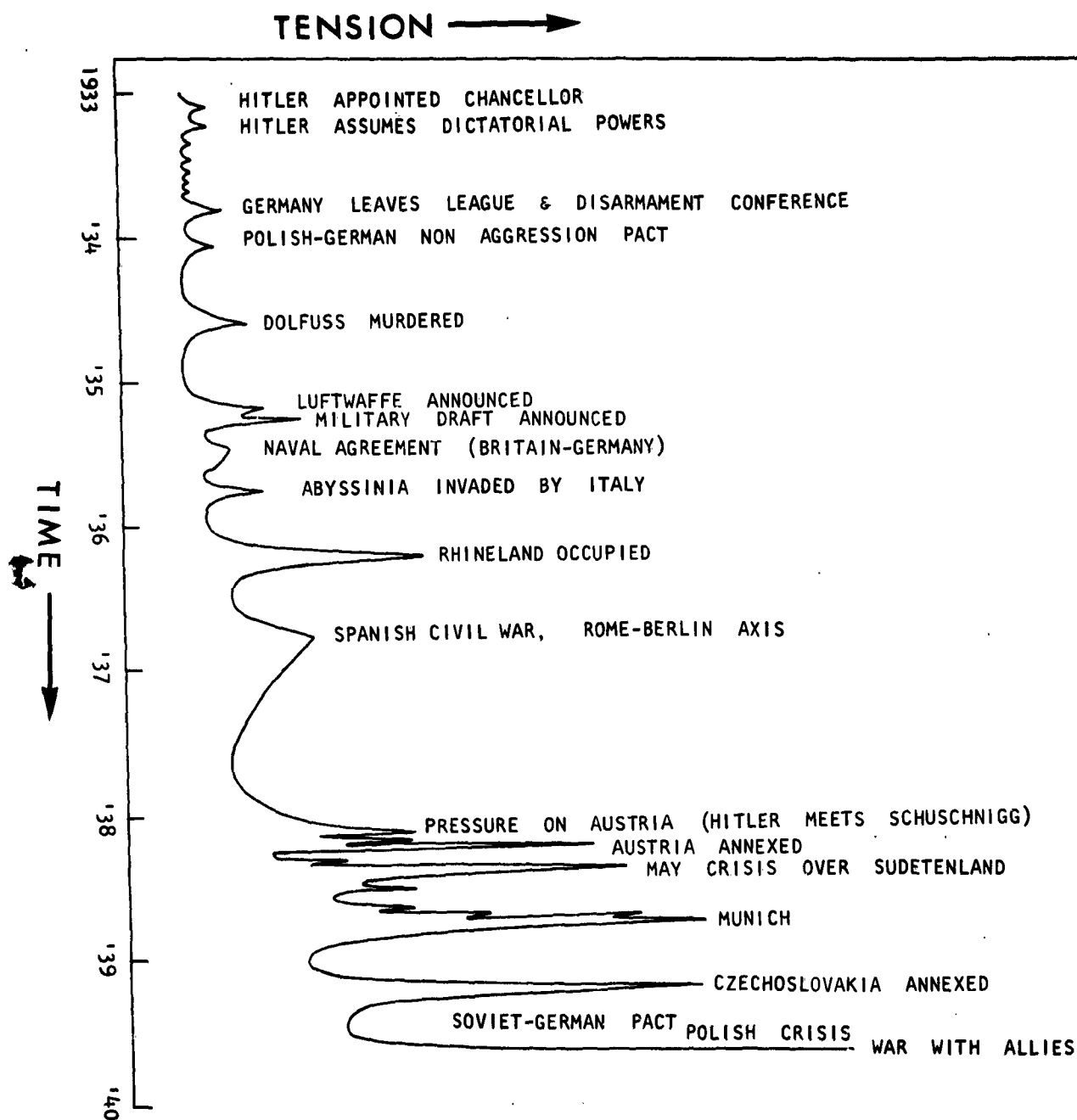


Figure 2

it has evolved through the reflections and studies of many people at the Institute, some of whom remember the impact of Hitler through personal experience, some within this country and others abroad. It can be seen from this example that the amount of warning received before England, France, Russia (or for that matter Austria, Poland, Spain, and Czechoslovakia) were plunged into war was, in some general sense, more than adequate, where a person could properly read the course of events. While such accurate reading is frequently extremely difficult at the time, nevertheless it is possible in times of tension to take some steps which hedge against the possibility that war might develop, steps which might be of a political, military or civil defense nature.

Because of the nature of modern weapons systems it is clear that the speed with which crises can be generated and attacks follow, that the available time may be considerably less than that during the Hitlerian era. It is, however, probable that available time could be measured in hours, if not in days or weeks. Our assertion is that in these kinds of situations a great deal of effective civil defense activity is possible, assuming that a sufficient amount of time and effort has been devoted to advance planning of actions appropriate to different degrees of crises.

The final remark that we would like to make about the general kind of fever chart illustrated by Figure 1, and which we believe is of some importance to the Office of Civil Defense, is one associated with a situation where there is a crisis or series of crises which result in a sharp change in the psychological mood of the people towards civil defense--which was illustrated during the 1961 Berlin crisis and again in the 1962 Cuban crisis. If we make the assumption that during the next few years this country would probably experience some tense periods in which the sharpness and the height of the spikes were much more severe than those experienced during the last few years, we should anticipate that there could develop a new national mood which would make civil defense matters extremely important. It is even reasonably possible that a positive attitude towards civil defense can become a requirement of any acceptable government policy. Should this develop, it would be useful for the Office of Civil Defense to have spent a certain amount of time considering ways to respond to these crises. For example, the feeling within the country in general could easily give rise to a billion dollar budget for civil defense, or perhaps much more, if the OCD is ready to handle programs of this magnitude. Whether they will be or not should be strongly dependent upon how much advance effort was put into considering these problems. The specific C.D. proposals to Congress for use during such emergencies can be resting in the files, until needed.

Another possibility, and perhaps one much more likely, is that during the peaks of crises, when the mood of the country could well be receptive to impressive civil defense programs, the acceptance could best develop if an appropriate presentation were made to the people by the Office of Civil Defense or by the President, by way of OCD. Consequently, the OCD can ask itself (a) how can it anticipate and react appropriately to various international fluctuations in temperature, as represented by various fever charts, and (b) what advance plans can the OCD make in order to use changes in national mood to facilitate phasing in programs deemed beneficial to the country. Because this matter is of a domestic political nature, it is beyond the scope of the Institute's current research to try to do more than point out the possibility of action available in this area.

To sum up, then, examination of the fever chart has led to the following considerations:

1. History and analysis both suggest that there is a substantial probability that any nuclear war, should one occur, will be preceeded by a period during which strategic warning will be given as a result of the political and military events which occur. This warning will make possible any of a number of different kinds of protective action.
2. The characteristic shape of the fever chart is one in which the oscillations tend to have sharp rises followed by sharp declines. The period of time involved during the rising and falling portions varies considerably, but can be expected to be on the order of at least hours or days, and usually, judging from historical example, will be much longer.
3. If the available time to take for civil defense action is of the order of two days or more, it may be possible, if appropriate plans exist, to develop more civil defense capability during this time than has been obtained during the fifteen years following World War II.
4. While in a general type of fever chart the base line can be either an increasing or a decreasing function, because of the cold war and the entrance into thermonuclear age, the base line which represents the current international situation is judged to be one which increases with time. The effects of a higher base line can be expected to make the response to crises more rapid and reach higher peaks.

5. In order to make effective use of the fever chart an organization, such as the OCD, needs to make preparations which anticipate that the national mood will change from time to time in the manner represented by these charts. The timing can enable proposed programs or actions to be accepted. Without such advance planning the sharp nature of the fever peaks is such that in many cases before a recommendation would be effective, the crisis can have passed or escalated and it would be too late.

Seven Civil Defense Tactics

We intend to define and examine seven distinct civil defense tactics. (1) Any complete civil defense program would be designed to contain a range of tactics in order to be prepared for almost any kind of emergency which might arise though, of course, alternative tactics may have varying emphasis. We would like to introduce terminology to distinguish the various civil defense tactics, mainly on the basis of the urgency of the situation in which they are to be used. Table I below sets forth seven alternatives covering a spectrum of possible actions. Consideration of these alternatives should be helpful in illuminating the possible roles of civil defense in war, foreign policy, and deterrence.

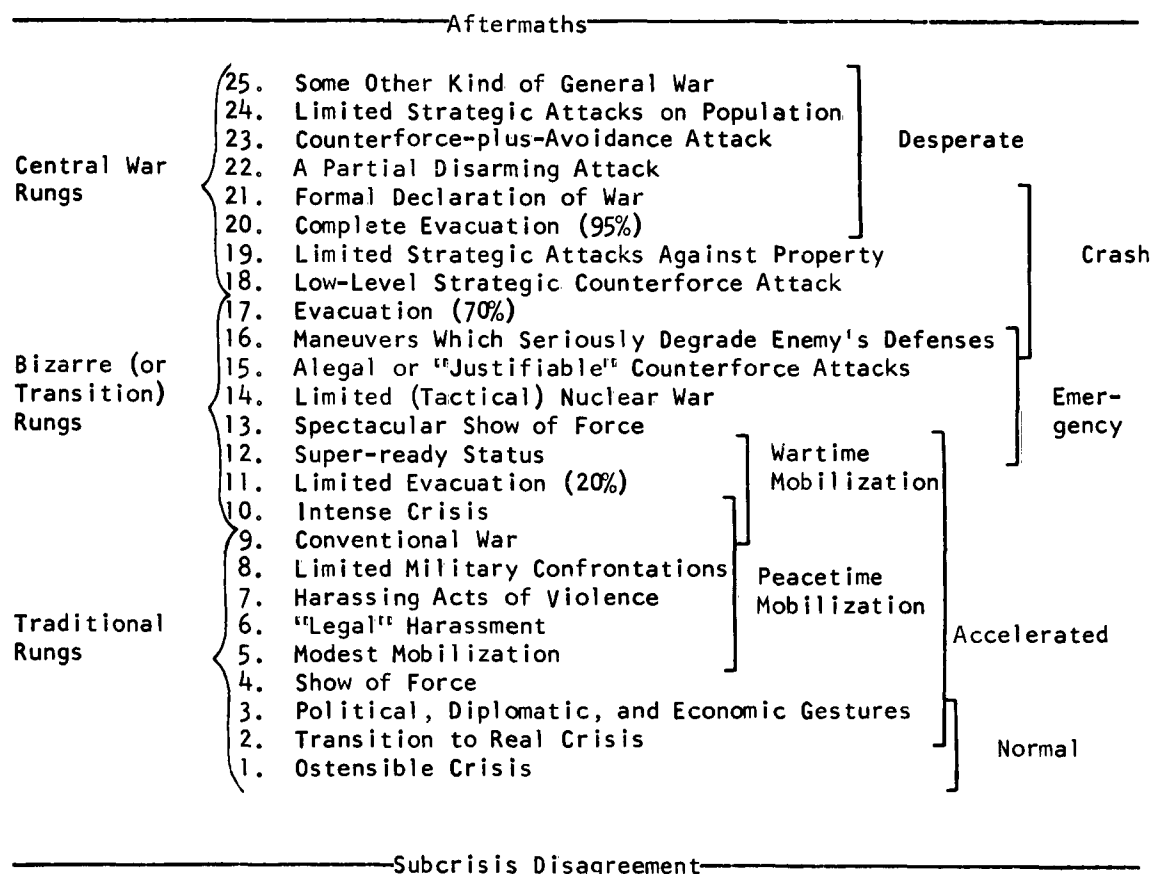
TABLE I

I. Crisis Programs	
A. Improvised Action	(0 - 6 mo.)
1) Desperate	(1 hr. - 7 days)
2) Crash	(2 days - 2 weeks)
3) Emergency	(1 week - 6 mo.)
B. Mobilization Action	(3 mo. - 2 yrs.)
1) Wartime	(3 mo. - 1 yr.)
2) Peacetime	(6 mo. - 2 yrs.)
II. Accelerated Programs	(1 yr. - 4 yrs.)
III. Normal Programs	(3 yrs. - 7 yrs.)

As the table makes clear, we choose to consider three distinct major classifications of civil defense tactics. Within the first main category, crisis programs, there are two major sub-categories--improvised and mobilization action. The crisis programs, as the name implies, involve a sense of urgency. They may be a reaction to international events of much greater intensity than chronic sub-crisis disagreement (Berlin crisis). In fact, the crisis programs might be defined today as applying to those states of affairs in which U.S. decision-makers are severely oppressed by the inadequacy

TABLE II

THE RELATION BETWEEN CIVIL DEFENSE TACTICS AND
AN ESCALATION LADDER



of existing civil defense capability. Within the crisis programs the improvised program differs from the mobilization program in that the former pays relatively little attention to the post-crisis legacy value of all the civil defense activities undertaken. The improvised program involves a hasty temporary expedient to meet an imminent threat. During all of the improvised programs we worry very little about fraud, red tape, and inefficiency. The problem involves getting the specific job done--that is protecting the maximum possible number of people within a relatively short time from the possible consequences of thermonuclear war.

At all times, it should be remembered that there are two strong elements which must be considered in civil defense. First is the prudential, based on the idea that even though we want to avoid it, war might nevertheless come and should this come to pass the more people and recuperative capacity that have been protected the better. The second aspect is the relationship to bargaining, various facets of which are presented in the discussion of the escalation ladder. (See Chapter II, pp. 102-134, and Table II of this chapter.) In brief, the bargaining advantages may arise from the increased capability--partly because of the implicit threat of even greater increases in capability, since by going to a great deal of trouble and cost in preparing a civil defense program, one has demonstrated, or at least indicated, that he is willing to risk further costs--and finally the increased effort or danger shows a commitment to avoid backing down. Of course the prudential and the bargaining aspects interact--on occasion supporting, on occasion conflicting.

The Desperate Program

The first improvised program is termed, Desperate. We are beginning by considering a tactic which implies a condition of terror in the country. It assumes essentially battlefield conditions where citizens in grip of a chilling fear will pay almost no attention to property and are willing to take a soldier's attitude toward casualties. In this type of program, just as in battle, lives will be risked. Just as a rolling barrage could be expected to destroy a certain number of one's own troops in accomplishing its objectives, so the desperate program could involve casualties comparable to or even greater than many peacetime disasters. The program is desperate because the U.S. decision-makers believe that protection from the existing threat may logically be sought with almost no attention paid to the costs in materials and they are willing to take large risks in human lives. In such situations the belief of the decision-maker will soon be shared by the general public--if only because the actions of the government will evidence the underlying fear. During evacuation in a Desperate crisis, railroad boxcars transporting evacuees could be deliberately crowded that sickness and in some possible cases even death might result among some of the evacuees. (2) Medical aid, for example, would be rendered to evacuees only where there would be no halt in the movements to safer areas. Large amounts of property can be destroyed for the purpose of providing protective construction or facilitating an evacuation. Lawns and parks may be dug up for earth fill for shielding or to provide trenches for improvised shelters. Doors may be removed; fences, garages, barns, and interior walls may be torn down for building materials. Essentially all the production of the large urban areas would cease, and perhaps 90%-95% of their population would either evacuate with extreme haste, in most cases by automobile or trains, but if necessary on foot, or find shelter in their immediate neighborhoods.

Obviously only the most extreme crisis on or near the uppermost rungs on the escalation ladder could justify such costs. To take an extreme case, the tactics might be ordered if we received a stark ultimatum from the Soviets demanding, "Dead or Red" or, somewhat less extremely a high degree of surrender. Although at this point to some it might appear crystal clear that the official ordering of the Desperate C.D. program presaged our rejection of the Soviet demands, this need not be true. The receipt of such a Soviet ultimatum, regardless of whether we are prepared to negotiate, involves such a severe danger of war, that prudential considerations alone might require this C.D. tactic. Indeed, if the ultimatum became known, then fear among the citizens of the U.S. might be so great that the Government could not avoid the decision to prevent the ineffective actions from an hysterical unguided population.

Whether or not at this point, the United States would be better advised to pre-empt with a full scale counterforce plus avoidance or partial disarming attack, or to risk a Soviet attack, will be affected by our estimate of all the considerations of Controlled War as discussed in Chapter II on pages 102 to 105--such things as the vulnerability and size of the Soviet forces, as opposed to ours, the estimates of the probability of the crisis ending in a compromise rather than war, and the effect of the C.D. action, itself, upon the strategic balance. The Desperate program might also be called for in a somewhat different hypothetical situation where the action could be triggered by either a limited strategic strike (e.g. Miami struck by a 1 MT weapon) or a slow low-level counterforce operation which appeared to be rapidly escalating. By that time, however, if some areas of the United States are so contaminated by fallout that movement from or through these specific areas would be dangerous, any evacuation portion of the program would require modification. The program might also be touched off by a large scale conventional war in Europe in which the Soviets, because of wide-spread revolts in the satellites, were clearly losing and rapidly becoming desperate. In these circumstances, if things were going our way, we would not take the terrible risk of attacking the Soviet Union unless we were quite convinced of Soviet intentions to attack us first. At this point the invocation of the Desperate plan might be mainly prudential rather than aggressive. Since our active defense forces would at this time be in their most alert condition, and our retaliatory forces in their most ready state (with increased airborne alert and possible dispersion of SAC to various fields), this would constitute a most inopportune time for the Soviets to attack--yet there is always some danger. While we might feel the situation was too confused or uncertain to risk passivity, it is somewhat more likely that a more appropriate response would be the use of one of the less extreme tactics in Table I.

The Crash Program

The Crash program differs from the Desperate program in being slightly less associated with terror. We are still not concerned with legacy value, and again are meeting an anxiety-ridden temporary situation. On the other hand, a Crash program is sufficiently less urgent than the Desperate program that we no longer compare to battle conditions. We are likely to choose to avoid either high risks of casualties or extreme hardship, even at the cost of somewhat diminishing the speed and efficiency of the operation. Nonetheless, we ignore many normal safety precautions which make it likely that there will be some casualties. As in the desperate program there could be great destruction of property, but since somewhat more time is available, property is

destroyed less wantonly, and large amounts of damage are avoided if they produce only small increases in protection. Although in the Crash program we ignore red tape, and a great many legal and property rights, we make some minor effort to keep records so that after the crisis we can straighten out the mess and achieve some equality of sacrifice. Moreover, although the Crash program, like the Desperate one, contemplates the stopping of essentially all production in major urban areas, in the Crash program we take time to perform simple acts which preserve the industrial equipment during the crisis. These acts might include the orderly shutting down of refineries and the covering of equipment to prevent damage by the elements. Precautions such as the banking of furnaces will be taken only in those cases where they can be accomplished in a relatively short time or where nearby shelter is readily available. The Crash program then differs from the Desperate program in a number of ways. First its probable cost in life and material is a great deal less; second, it provides a greater protection to population and recuperative power; and third, it is considerably slower.

The Crash program might be invoked in two main types of situations. The first involves those in which it is believed that a substantial danger of war exists in the very near future, although not momentarily, as in the previous case. This situation might also occur if we received a quasi or limited ultimatum from the Soviets, or if a low-level controlled strategic retaliation had begun with a bomb on U.S. soil. In this type of situation, prudential considerations would again appear to be urgent. With the Crash program we would be taking protective action commensurate to the risk, and in addition improving our bargaining position. But it is this increase in bargaining and threatening position that may put the opponent under pressure to pre-empt. After all, we are not only in the process of getting ready for a war, but we are, in a sense, saying that we are willing to have it.

In a second type of situation, the bargaining aspects of a crisis C.D. action might appear to dominate the prudential. This type of situation could occur if a massive Soviet attack on Europe had been launched which was overwhelming all resistance at a reasonable rapid rate (see illustrative scenario, Appendix B). The Crash program would appear extremely threatening since it might appear likely that no Soviet threat would be directed against the continental United States at this time; rather, it might appear that the Soviets would prefer to wait until the assets and productive capacity of Europe were at her disposal before putting any further pressure on the United States. On the other hand, it might very well be that the Soviets might anticipate sufficient disorganization in the Western European economy as a result of the war, so that if we then increased our defense expenditures greatly,

our strength, as opposed to that of the Soviets, would be relatively greater five years after their attack upon Europe, than before. Thus the Soviets could argue that a direct strike against the United States should be delivered before an American mobilization could take effect. Therefore the Crash civil defense program can be based on strong prudential reasons. It must be remembered that the Crash civil defense program itself would prevent, at least for a short while, the productive mobilization of the United States, and the building of a civil defense capability with a large legacy value. Accordingly, even if done prudentially, the Crash program might look like an attempt to achieve a reasonably high degree of protection for the population before ordering a strike against the Soviet Union or sending an ultimatum to them--speed being necessary partly because of our desire to act before Western Europe was overrun and partly because our resolution may falter if we wait.

The Emergency Program

The emergency program is much less threatening than the previous two. Somewhat more direction from central offices may be planned than in the more urgent programs, though noticeably less than in subsequent programs to be discussed. Safety standards are relaxed a little but anything much less than peacetime standards for accidents is unlikely. While there can be some destruction of property, efforts are made to avoid this. Moreover, even though this program is a reaction to specific kinds of tense international situations plans are designed generally without the intent to preserve legacy value, but nonetheless we strive for a certain bonus legacy value where it can be achieved without unduly compromising the civil defense preparation. Thus, when shelters are to be built, we would make some effort to locate them where the effects of weather and the possible future uses of the land and structures will not be prohibited. Evacuation of large industrial areas is more orderly and less hurried than in the previous two programs, and considerably less complete. Perhaps 60% of a large urban area might be evacuated. The emergency program signifies our concern with the crisis at hand and our feeling that we are in great though not imminent danger. We believe that this crisis will have to intensify before we are in great danger of war but on the other hand we can expect some intensification.

By adopting the emergency program we not only signify our willingness to go to further trouble to avoid political retreat, but we put ourselves in a better position to take firm positions quickly. Moreover the preparations of the emergency program are

also prudential since there is believed to be a substantial danger of war developing out of this period of high tension. If the crisis escalates, we may evacuate the remainder of our urban population by switching into one of the previously discussed plans.

The emergency program would seem appropriate in a situation where the Soviets were putting violent pressure both on Berlin and some other European crisis point such as West Germany. This pressure could even involve a limited Soviet ground attack. But the situation, however, would appear more stable than those discussed under the previous two programs, since neither side would as yet appear to be winning or willing to commit itself to full scale conventional war. This program also seems appropriate to a situation, more likely in the early 70's, where Red China had launched a conventional attack against Formosa and was threatening a nuclear attack upon the United States should we interfere.

Each of the crises mentioned seems reasonably far from general thermonuclear war and dependent upon our standing firm before any such greater danger can appear. The use of the emergency program indicates some firmness on the part of the United States. The fact that so little effort is made to insure legacy value shows our commitment and indicates that in this particular situation we intend to act with resolve rather than merely to acquire a general capability to strengthen our future position.

On the other hand, the prudential aspects of the emergency program are also of great importance. Even should we take no C.D. action in any of the above crises, there would exist palpable danger of war arising from the existing tension. As Table II shows, we are well up on the escalation ladder; the higher rungs may be ascended so quickly as to leave little time for much more than automatic military response on the part of the United States.

The Mobilization Programs

The next two categories of civil defense program are the mobilization programs, wartime and peacetime. In both of these the urgency is less than that in the crisis programs. We need no longer be preparing for one or a very small number of existing specific crises but rather for a generally deteriorated international situation. We are interested in legacy value and in keeping costs down somewhat. On the other hand we are willing to see the costs greatly increased over the most efficient (and slow) method of achieving the capability. We cut red tape and achieve speed at the possible expense of efficiency, carefulness, and protection against fraud. The constraints upon the amount we spend on mobilization programs are primarily the gross national product and the needs of competing military programs. In World War II we spent approximately 43% of our GNP for military purposes. In view of the fact that we are somewhat wealthier today it is not unreasonable to assume that we could bear a yearly expenditure of up to 50% of our GNP for these purposes, or about 300 billion dollars. Moreover, even this increase in total military budget may not give a proper picture of the improvement in our civil defense posture. Increases in civil defense are relatively much more significant than the same dollar increase in the strategic budget for military capability; that is the percentage increase is much greater. In one sense this can be psychologically important since we are now facing up to the possibility of war rather than just deterrence. During a crisis, it is not the concept deterrence that can make the other side back down but the threat of escalation. The usual deterrence argument "if I stand firm he will back down," has a sort of hollow sound to it if the other side doesn't seem to be backing down.

The more urgent of the mobilization programs, the wartime program, dispenses with most bureaucratic red tape. As a result some costs may go up greatly--perhaps by a factor of three over a slow peacetime program. Although we are most interested in legacy. As a rough estimate we may achieve somewhere between 50 and 75% of the legacy value of a cautious program. On the other hand, we do keep reasonably careful records in order that we may later straighten out the confusion caused by the haste and recover excess profits and damages for fraud. We make efforts to evacuate some "non-essential" inhabitants of urban areas. The wartime mobilization program is designed for crises such as several Korean type wars developing nearly simultaneously, some possible wars with China where the use of nuclear weapons does not seem imminent, and possibly a "phony" war with the Soviet Union. The phony war might be among the weakest reactions the Soviets might expect in case they launched a ground attack in Europe.

The wartime mobilization program signified our willingness to prepare for the long haul. It is prudential in the sense that we do not know when we may need our capability but expect that when we do need it we will have it. The fact that we are undertaking such expenditures to gain this capability should imply that we are taking the danger of war seriously not only because of specific past crises but because of a deteriorating international situation.

The second of the mobilization programs, the peacetime program, involves some cutting of red tape, consequent willingness to accept a few inefficiencies and increased costs, though much less than in previously described programs. We are correspondingly more interested in legacy value and will take few if any actions which will not assure it. In the peacetime mobilization program the government will not evacuate anyone compulsorily, nor will evacuation be encouraged, though of course preparation can be made for possible use of the more urgent programs with increased speed and efficiency. The peacetime mobilization program is designed for situations where the international situation has deteriorated and shows signs of deteriorating further. The program envisages a situation like the Korean war or even two such wars being waged simultaneously in different but relatively peripheral areas of the world, or an intense Berlin crisis where economic pressure being applied against the city and most competent observers anticipate some Russian attempt is imminent to win the city by S. U. military moves combined with East German political activity. In some ways the use of the peacetime mobilization program at this point might be interpreted as an encouraging sign by the Soviets. It can indicate to them that we do not expect any major war in the immediate future nor for that matter do we regard it as likely within the next year. On the other hand, we are obviously preparing to go to war over any sufficiently threatening dispute; there are limits to how far we can be pushed.

The Accelerated and Normal Programs

The accelerated program is essentially a normal civil defense program taking account of the fact that we have already delayed too long. We are therefore primarily attempting to make up lost time and are moving as fast as possible consistent with not inflating the cost too greatly. In the accelerated program we do not expect to spend more than we would under the normal program to get any given capability. Although there is not a great deal less red tape than in the ordinary day-to-day actions of government, each of the requests for bureaucratic approval is marked "expedite" and complaints of delay are checked to make sure that none occur which prevent reasonable efficiency. The amount we spend for the accelerated program is not directly limited by the GNP but by the competing demands of military programs, foreign aid, and a desire to keep a reasonably balanced budget. The accelerated program is defended primarily on prudential considerations. It may be believed that in some cases it does increase our deterrent capabilities slightly, but the main consideration is that we believe more strongly that war is possible and feel that a larger number of survivors is better than a smaller number. The effect of this accelerated program upon our allies can be beneficial. We are not preparing hurriedly for any particular crisis and do not appear to be acting rashly or extravagantly. Nonetheless we are moving with dispatch to put ourselves in a position where we can carry out our international obligations without inviting suicide. Nor would we expect an accelerated program to appear terribly threatening to the Soviets although it might be an expenditure which would increase the offense-defense arms race. It is not so elaborate a program that the Soviets could reasonably fear a pre-emptive attack in the near future.

The normal program is one in which our expenditures are determined not so much by competing considerations of national security but by competition from all types of government spending. There might even be calls for reduction from Congressmen who would rather reduce the national debt or decrease taxes. In the normal program many actions are stretched out over a period of years, in some cases mainly to avoid having too much expense in any one year. Moreover, at least during its beginning years, no particular effort is made to expedite any phase which appears to be lagging. On the other hand, long lead time items are purchased and contracts are left for research designed to reduce expenditures and develop greater efficiency.

Although the normal program is an attempt to face up to the dangers of thermonuclear war, it is taken at such a slow pace that it appears almost pro forma. Nonetheless, dramatic reductions in our vulnerability can be made under this program which may reassure our allies without unduly alarming the Soviets, who currently appear to have at least a similar program of their own. Again the normal program is not tied to any individual crisis, and indeed need not be tied to deterioration in the international situation. Rather, it is based on the premise that weapons of mass destruction exist and that it would be foolish not to allocate modest amounts for some degree of protection.

Preparation for Civil Defense Tactics

All of the above programs can be thought of as consisting of two parts. Part I would be the plans and preparations for the survival of as large a percentage of the population as possible. Part II would be the plans and preparations for the recovery and recuperation of the national economy and institutions as well as furnishing the necessities of life to the individual survivors of the war. The population survival portion of the program can itself be thought of as breaking into two main components. The first is a shelter program against fallout, (and possibly to some extent, blast, and fire). The second is an evacuation (population dispersal) program, supplemented by some type of (fallout) shelter program, whose purpose is to provide some survival potential for regions where either a sufficient number of useful shelters does not exist and cannot readily be improvised, or where dispersal seems desirable because of the threat of a population attack.

Since the components of a shelter program, fallout, blast, or both, have been and are being considered rather extensively by the OCD, our detailed considerations here will not focus on them. Instead we will first try to determine what evacuation capability can be achieved through planning and preparation and then examine some relevant problems of recovery and recuperation potential.

We would first, however, like to distinguish five degrees of preparations which may be made in anticipation of a shelter or an evacuation program during a crisis. In contrast to the prior discussion where one of the most obvious criteria distinguishing the various crisis tactics was the time needed or envisaged by the tactic. The salient criterion for distinguishing various types of programs for advance preparations is their cost which is the basis for Table III below.

TABLE III

ALTERNATIVE PROGRAMS FOR C.D. PREPARATIONS
ANTICIPATING CRISIS TACTICS

1. Paper plans only (\$10-100 million)
2. Paper plans plus inexpensive preparations (\$.1 to 1 billion)
3. Paper plans plus modest preparations (\$.5 to 2 billion)
4. Paper plans plus moderate preparations (\$1.5 to 4 billion)
5. Paper plans plus extensive preparations (\$3 to 20 billion)

The paper-only plan can be valuable if a need for an improvised program develops unexpectedly. If, for most parts of the country, such a paper program constituted all the crisis civil defense planning that existed when a thermonuclear threat developed, many millions of lives could be saved by having made the relatively insignificant expenditures on such planning. Because of this, we intend to devote a disproportionately large amount of time outlining one or two such plans in order in a preliminary fashion to demonstrate their feasibility and estimate their effectiveness. In addition, a paper-only plan, when developed for the improvised crisis situations of Table I, should provide some indication of what might be useful for more elaborate programs requiring greater degrees of preparation. The initial cost estimate of \$10 to 100 million constitutes a first intuitive estimate of a reasonable range for a paper-only program. The kind of paper and planning associated with this kind of effort is illustrated in the next chapter.

Paper - Only Preparation for Evacuation

A paper-only program might involve the stockpiling of appropriate sets of paper plans in various parts of the country with instructions to make the public aware of their contents by mail or newspaper distribution of leaflets and/or through radio and television broadcasts. This information, tailored to local survival needs and released according to a predetermined schedule, should provide as much information as can reasonably be provided on paper to assist in the planned survival activities. Such plans may include information about radiation threats, decontamination techniques, evacuation routes, reception areas, emergency shelter construction, survival supplies, responsibilities of local and federal government, communication problems and their solutions, etc.

Our approach to developing a paper program using evacuation for, say, a Desperate crisis situation, is to set forth first the various types of problems anticipated for an evacuation plan, analyze the tradeoffs which can be made in any solution, apply various solutions to map exercises for chosen regions of the country, uncover the additional problems which crop up as a result of the studies, where possible develop useful new solutions, and finally, sum up the survival potential of the nation, through evacuation, for selected nuclear attacks where various alternatives of the programs for the strategic evacuation are assumed to have been put into effect. Where time has permitted, the cost of certain portions of the evacuation plans has been estimated.

Paper Planning plus Inexpensive
Preparations for Evacuation

The second type of preparation, namely, one which involves not only paper planning but includes some inexpensive preparations, has received a disproportionate amount of effort in these preliminary studies. We would expect as the paper planning proceeds, to find that certain preparations seem to demand greater attention, in that for small expenditures much survival potential is gained. In all probability there exist certain inexpensive preparations which would greatly enhance the survival value of each of the programs set out in Table I. Our approach is to design one or two such plans in some detail to indicate what studies are needed, and to illustrate the importance of specific relatively simple and inexpensive preparations. However, we should remark that some of these inexpensive preparations may eventually appear through the growth of the regular civil defense program. Such things as distribution of radiation meters, the redistribution of certain emergency food stocks, special warning systems, stockpiles of medical supplies, etc. are already programmed and only to the extent that these (and other items) will not be available in the time period for which a plan is designed will preparations be required. A plan, once completed, will therefore require continual periodic updating in order to take into account new learnings, changes in the strategic situation, as well as the irregular progress of the ongoing civil defense program.

The studies concerned with the design of paper-only plans and paper plans plus inexpensive preparations for an evacuation capability throw a considerable amount of light on what could be done if a decision was made in favor of a more expensive program. It helps one to develop some idea of the value of such additional expenditures in addition to some ideas of what studies need to be done in order to facilitate the planning for costlier programs. After such preliminaries, it should become possible to formulate in some detail the characteristics of the programs utilizing modest, moderate or extensive preparations.

Plans of different costs which can be drawn will, in each case, be dependent on the existing civil defense program. As inexpensive, modest, moderate or extensive preparations come into being through the ongoing normal civil defense programs, such preparations can periodically be integrated into the crisis plans. To illustrate, suppose OCD submitted a proposed plan to Congress for a crash program which requires modest advance preparations, and whose costs are, say \$1.5 billion. This plan may be judged too expensive when initially presented, but may, with the passage

of a year or two, become acceptable because of the fact that, among other reasons, the ongoing normal civil defense program will have provided some large portion of the required preparations. In this event, the general strategic situation having made such a decision desirable, the OCD can update the plan and arrange to purchase the balance of the preparations.

Preparation for Recovery and Recuperation

A classification similar to the five-fold division of different types of preparation for survival is possible for the preparations for recovery and recuperation. These preparations are not necessarily intended to be the complete recovery and recuperation programs themselves, but rather suggest certain beginning preparations in order, subsequently, that the more complete preparations may be made with greater speed and less cost. These five programs using the terminology given earlier are shown in Table IV.

TABLE IV

ALTERNATIVE PROGRAMS FOR PREPARATIONS FOR
RECOVERY AND RECUPERATION

1. Paper plans only (\$10-100 million)
2. Paper plans plus inexpensive preparations (\$.1 to 1 billion)
3. Paper plans plus modest preparations (\$.5 to 2 billion)
4. Paper plans plus moderate preparations (\$1.1 to 4 billion)
5. Paper plans plus extensive preparations (\$3 to 20 billion)

For a thorough analysis, each of these five approaches should be considered with each of the programs of Tables I and II. As this would then require a rather impressive set of studies, it is far from our intention to do this work. Rather we will only mention some thoughts in one or two illustrative cases and leave the rest for some other time or for other contractors.

The paper-only plan indicated above should, during its preparation, suggest certain sets of advance preparations which might be made by the Government in order to facilitate the recovery and recuperation and thus to suggest ideas for the more elaborate programs for recovery and recuperation. Referring to Table III, the study of program #1 facilitates understanding of program #2, the study of #2 facilitates #3, etc.

If we believe that certain provisions may be urgently needed in post-attack emergency conditions, it may be possible to obtain or construct some of them provided we have completed some advance stockpiling of critical parts. Typical might be such stockpiles as nuts, bolts, screws, nails, and small tools, which together with some do-it-yourself instructions, blueprints, or books could facilitate housing and furniture repair or construction. Ultimately an attempt needs to be made for persons in different parts

of the country to think through their immediate recovery and longer range recuperation needs, and for each organization (industry, utility, farm, government, etc.), to think through its requirements and ask what preparations can be made in advance especially what long-term lead items are required to facilitate such preparations. It would be enlightening to illustrate this procedure by analyzing specific cases which will indicate the needs of say, one industry, one governmental agency, or one commercial company, through such a study it may be possible to develop a realistic picture of the kinds of preparations needed and lead times involved.

It should be clear that in order to do a thorough job it will be necessary to take into account the requirements of individuals, local governments, and institutions. An effective operational plan will require a detailed analysis with a great deal of data obtained from local sources. Certain institutions, communities, and individuals can be given some detailed contexts and encouraged to study these problems through on their own behalf, following which an integration of these various efforts can be made. Some work of this kind may exist in current literature, and the balance can, hopefully, be stimulated both by Government and private institutions. One of the important reasons for studying recovery preparations is to define those geographical areas in which this type of research and planning needs to be performed on a local basis. If the OCD ever gets into the 3rd, 4th, or 5th of the above plans, billions of dollars will be involved, and consequently, the kind of detailed effort mentioned above would probably be a part of the initial research plan.

Interaction: Analysis Based on Conventional War in Europe

As an example of some of the interactions between the deterrent, prudential and bargaining aspects of various improvised programs, consider the possible effect an assumed ability to put these programs into effect would have upon the range of choices and attitudes open to a Soviet decision-maker contemplating a large-scale conventional attack on Western Europe during the early sixties. (3)

The S.U. decision-maker may feel that if he attacks Europe he can deter our striking him, even if we first evacuate our cities. His confidence in his deterrence of an American attack would presumably be based on his belief that his retaliatory force could do unacceptable damage to the United States even if our vulnerability were reduced by an evacuation. The S.U. decision-maker need not believe that his deterrence of our nuclear response would make us completely passive. All he need feel is that we will be deterred from making any response which he cannot accept. Those "acceptable" reactions could include U.S. local aid to Europeans, a "small" U.S. controlled response, or even a U.S. declaration of war--but one not followed by an all-out or even a large strategic attack.

In reaching this conclusion he may or may not have taken into account the possibility that the U.S. could fight a controlled war and successfully forestall some of his responses, but in any case let us assume he is not deterred from an attack in Europe.

After an attack on Western Europe, the U.S. may evacuate and strike the S.U. Alternatively, it might be that our actions to reduce our civilian vulnerability could cause the S.U. decision-maker to change his mind about his ability to deter the U.S. from an attack and therefore to pre-empt. In either case an all-out war would follow as a result of miscalculation.

Aside from the possibility of contributing to a way by miscalculation, having an emerging Civil Defense plan capable of so lowering our civilian vulnerability as to destroy the Soviet Union's deterrence of our attack in reprisal to a major provocation can affect our deterrence of this provocation in two major ways. First, it would make the Soviets less likely to attempt a major provocation such as an attack on Western Europe or the U.S. (hopefully deterred by our second-strike ability), they may choose some other strategy, perhaps the generation of a crisis in which they may be able to achieve peacefully or by means of threatened force some of the gains they desire, or perhaps they may decide that they are better off not doing anything dramatic at all.

If the Soviet decision-maker does not know of our C.D. crisis capability or if he does know but feels that we would not use it, the situation may be less stable. If the S.U. decision-maker finds out about our C.D. plans only after his attack on Western Europe, he will have to think his problem through as he goes along under the pressures of time, stress, and confusion.

If the Soviet decision-maker knows of our civil defense capability but believes that we will not use it either because the cost would be too high or because we would not risk destabilizing the situation, he can ignore it as an important factor. Even if in a sense he has calculated these subjective probabilities correctly, he may be unlucky and the unlikely events may nevertheless occur. He may also wish to hedge against his possible miscalculation of these probabilities. He therefore might design contingency plans for use in case we should activate the C.D. plan. These contingency plans could consider the following alternatives.

- a. pre-empt
- b. escalate by launching a missile attack upon U.S. nuclear weapons bases in Western Europe
- c. continue the conventional attack as started
- d. negotiate

Pre-emption

In view of the great advantage in striking first as opposed to being struck, it would seem that the Soviet planner might consider a nuclear strike at the first sign of a U.S. evacuation.

On the other hand, the U.S., realizing the tension caused by any moves to evacuate, would probably be on super-ready alert so that an attack at this time would appear inadvisable. Nor would a strike at the U.S. simultaneously with attacks on Western Europe appear advisable, since whatever preparations--such as moving large numbers of divisions from Russia through Eastern Europe--were made for the attack on Western Europe would cause our forces both in and out of the U.S. to be on a heightened state of alert. In all probability, a "pre-emptive" attack, were it out of the blue, might have the best chance of success since the Soviets would then avoid any action which would alert our forces. If this attack were completely successful, the rewards would be at least as great since it is most likely Western Europe would then fall anyway. Even in time of complete lack of tension, however, our SAC maintains an alert status designed to discourage any such attack. Moreover, so long as the U.S. maintains a strategic superiority it is likely that unless the pressures toward the attack are enormous (in which case they would probably be reflected in increased tension and alertness) any attack on the U.S. would require a degree of recklessness which the Soviets do not seem ready to risk. Thus, it would appear that the Soviet planner might well decide that an attack on the U.S., after his attack on Western Europe, would be too difficult to be successful, that such an attack would be less difficult just before and least difficult if "out of the blue," but in on case would success appear highly likely. After all, it is the purpose of our deterrent posture to accomplish just this.

Escalation

Nor would a plan to escalate by attacking U.S. missile bases in Western Europe at the first sign of a U.S. evacuation appear to be a satisfactory solution for the Soviet decision-maker. By attacking Western Europe first he would make certain that our bases there are under the greatest alert. Therefore if anything goes wrong in his attack, he may suffer retaliation from these bases. Furthermore, he cannot be certain but that an attack upon these bases would immediately trigger a U.S. attack even though his conventional attack did not. This would be somewhat more likely after his strike at our bases than before, since by hypothesis the evacuation would have already begun. Moreover, not only would a nuclear attack on the bases in itself be a provocation over and above the conventional attack on Europe, which provocation might itself trigger a U.S. attack, but a nuclear attack, indicating a degree of recklessness on his part greater than did the previous conventional assault, may fortify our belief in the necessity of our striking first before we are attacked.

Lastly, whether this attack on our bases in Europe might disarm us in any serious degree and make a successful attack by us less likely would depend upon the location of our forces and the percentage of our striking force located outside of the area attacked. Since the greater part of our strategic force is based in the U.S., this tactic might have the effect of making our attack much more likely without seriously diminishing its impact.

Continue the Attack on Europe

If the Soviet decision-maker has chosen neither to attack the U.S. nor to escalate by attacking our European bases but to continue his attack as started, he would undoubtedly be dismayed if we initiated an improvised C.D. program.

First, it would be a demonstration of will which would imply our willingness to incur "great" costs to halt the attack on Western Europe, and second, it could be expected to give our population a degree of protection so that the damage caused by a Soviet second strike would be reduced to a level which we might incur in order to halt this provocation. In this situation the U.S. attack might range from a full-scale counterforce-plus-avoidance or partial disarming strike to a low-level controlled counterforce campaign. A limited strategic retaliation designed to force our will upon the Soviets would also be a possibility although this has several disadvantages as opposed to other options (see Chapter III). Although

It is possible that the Soviet decision-maker might believe we were only bluffing and that the evacuation would be as far as we would be willing to go, he could by no means be certain. His calculations would have to take account not only of our resolve but of how a Soviet second-strike capability might look to us, to what extent we might rely on our ability to wage a controlled counterforce action while deterring the Soviets from wreaking massive countervalue damage on us, and how we might evaluate the protective value of the whole range of improved programs.

For instance, should we instigate the desperate program, the Soviets might well fear that an attack might already be on the way. The desperate program while it might be the most appropriate plan to accompany an immediate U.S. strike has a great disadvantage if it accompanies an ultimatum. Depending on the degree of preparation made in advance, the desperate program, while it would yield a large degree of protection, could be difficult to hold long enough to allow us to force the Soviets to retreat by threat of attack--especially if they were able to stall for a while. The Soviets, knowing this, might feel that if our attack should not arrive almost immediately, we probably would not attack at all. On the other hand, it might be hard for them to see why we would take such a risk of provoking pre-emption when we might use less provocative crises programs instead.

One possible reason could be a prudential consideration. Since they would know that we could not be sure whether they might have planned to attack as soon as we order any improvised program, they might feel that the aim of initiating our desperate program was to give us the fastest protection against this possibility. In this case, if our preparations had been sufficient we might retain the option of striking somewhat later or even of holding long enough to negotiate their withdrawal from Western Europe. Going into the crash program could then be a demonstration of our confidence in our deterrence of attacks on the U.S. since it would not use the hedge of activating the desperate program first. Moreover, a crash program, given any level of preparation, not only would achieve a higher degree of population protection than the desperate plan but might also be held longer. Thus, it might be held for a time sufficient for us to come to a satisfactory agreement with the Soviets on halting their attack and withdrawing from Western Europe. On the other hand, should the Soviets stall we might still be placed in a position where we could not get sufficient guarantees of cessation of attack and withdrawal and would have to decide whether to strike the S.U. or end the evacuation that the Soviets might be conceivably confident that in such an ambiguous situation where a peaceful resolution appeared close we would not attack. This confidence might be justified, but the protection we could give our

population both if the evacuation were ended and if it were not, our estimate of the internal political difficulties of ordering another evacuation should the Soviets renew their attack, the costs of backing down, the apparent success of the Soviet attack in Europe, the variables discussed in Chapter II, pp. 102-105, and the personality of our President would all influence the likelihood of some type of U.S. attack at this time. It would seem that any Soviet planner determined to ignore these factors and rely instead on U.S. reluctance to strike might be impelled to re-think his commitment.

The emergency program, while it might provide a higher degree of protection than the previously discussed improvised programs, requires so much time to complete that it may have serious comparative disadvantages where a large-scale attack on Europe has occurred. These would not be serious in the case where our conventional forces in Europe might be holding their own or retreating only very slowly. In this situation the emergency program would be partially a prudential hedge against a situation where satellite revolts or other fortunes of war might so turn against the Soviets that they would feel they must have a quick knock-out by pre-empting. Moreover, the emergency program in this situation provides us with an option of getting a higher degree of protection quickly by switching into the desperate or crash program. This might be necessary should the Soviets successfully escalate by using tactical atomic weapons or should the NATO forces suddenly collapse. We would then be in a better position to complete our evacuation and engage in a controlled war to force a Soviet withdrawal. Where the Soviet forces are advancing rapidly, however, the emergency plan, since it costs less and is much slower, shows lesser commitment and places less pressure upon the Soviets to come to a quick agreement. Moreover, insofar as it allows time for a more complete conquest of Western Europe, it may be countered by Soviet action. For instance, if the Soviets could move to the English Channel in one month, they may spread their bombers over Western European bases and may even install numbers of soft ICBMs in Western European cities.

Negotiation

The option of the Soviet decision-maker to negotiate some settlement is probably the hardest for us to deal with. Since we would presumably prefer an end to his provocation without our attacking to being forced to attack, we would be anxious to discern his intention to renounce the attack in his actions contemporaneous with the negotiations. On the other hand, since no practicable evacuation can be held indefinitely, we may after a time be faced with rapidly increasing vulnerability and a situation forcing us to make a decision whether to attack or to rely on what steps the Soviets have already taken, but their fear of a later strike to

stop their attack on Western Europe (of course, we might go into a second evacuation, but this involves considerations which we do not wish to go into here). In this calculation, the previous progress of the Soviet forces would be of the utmost importance. If their attack should have met great resistance and was gaining ground only slowly, it is possible that a cease fire would have benefited the defenders so that it might not be too difficult to negotiate a settlement. On the other hand, if the Soviets had already destroyed a large portion of the NATO forces and were deep into or even beyond Germany, securing a withdrawal and preventing a recurrence might be much more difficult. Moreover, the Soviets might be better able to temporize by pointing out the difficulty of arranging a withdrawal so quickly from so much territory. It is precisely because it is so difficult to tell whether negotiations might actually be proceeding toward a resolution of the dispute and because the time pressures on our decision-makers are so important that evacuation which cannot be held for a period of time could be extremely dangerous both to the Soviet Union and ourselves. Although negotiation might be the best option open to the Soviets, it would not be a very satisfactory one. First of all, they might be forced to back down, and secondly, even if they intended to do this, we might not be convinced of their intentions and might be forced to strike them anyway.

It would therefore seem that, still assuming our strategic superiority, no one of the Soviet responses to our evacuation upon their attack on Western Europe would be satisfactory. Thus, by maintaining a clear objective capacity for going into the crisis program and making clear our will to do so if necessary, we may deter the attack on Western Europe. Furthermore, we may thus avoid taking the Soviet decision-maker by surprise with our evacuation, and may therefore prevent a war by miscalculation.

NOTES

1. The words tactics and strategy have a somewhat ambiguous meaning. One common usage depends on the level of analysis or the point of view of the analyst. For example, most people in a line job seem to think of the activities of their superiors as being strategy, of subordinates as being tactics, and their own job as partaking of, or requiring both tactics and strategy. In this sense one man's tactics is another man's strategy and vice versa.
2. In principle if we, say doubled the number of people being transported at the cost of injuring 1% or 2%, this cost would be accepted. The successful transportation of the 98% or 99% to places of greater safety would outweigh the immediate harm to those injured.
3. Given a strategic situation roughly equivalent to the present U.S. strategic superiority.

CHAPTER V

AN ILLUSTRATIVE STUDY: STRATEGIC EVACUATION PLAN

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CHAPTER V

AN ILLUSTRATIVE STUDY: STRATEGIC EVACUATION PLAN

Introduction

Chapter V discusses plans which might be appropriate to crisis situations. Some aspects of a strategic evacuation are detailed in it. In general, the separate sections are built around the requirements of an evacuation which would take one week--the one week plan--although some other possibilities are discussed. These plans represent the focus of the chapter and are described in Section D. That section also deals with the effectiveness of an evacuation to protect against population attacks. The reader who is primarily interested in the scope of the evacuations may wish to turn to Section D first.

In Section B some of the principles guiding our choice of reception areas are set forth. The kind of attack against which an evacuation might afford protection is shown in Figure B-1. In Section C important transportation considerations are discussed. Our proposed use of railroads should be of particular interest as elaborated in Section C.1. Automobile transportation for a majority of evacuees is the subject of Section C.2. Figures C-2 and C-8 show the most important automobile and rail evacuation routes. In Sections E, F, and G, problems of Shelter, Food and Medical care are considered.

In Section H we summarize some arguments for and against strategic evacuation. These arguments do not analyze in any detail whether or not evacuations like the one-week plan should be tried and in what circumstances. They are in the nature of "pure" arguments that might be made in a reasoned debate conducted in broad, general terms without introducing many details of a particular situation. A more complete discussion and synthesis of the arguments will appear in other Hudson Institute reports. These "building block" arguments are included because we recognize that this subject is properly controversial. No discussion of the technical details should be allowed to obscure this point.

Finally, Section I contains some appendices. In the first appendix some past evacuations are described. While these are smaller than the ones we have constructed, they are nevertheless revealing. The second appendix features an evacuation "scenario," dealing with one kind of situation which might make the one-week plan appropriate. It illustrates a very serious kind of crisis, typical of our assumptions for the entire chapter, hopefully orienting the reader and helping him to compare the risks and costs of an evacuation in the context of a specific situation.

The final item in the appendix imagines the possible impact of two hypothetical wars on democratic values in the form of a scenario. It is intended to stretch one's imagination by considering how an "easy win" might lead to dictatorship while a "very near loss" involving great destruction might still leave democratic values intact.

It should be clear that the portrayal of different aspects of strategic evacuation in this chapter does not encompass all the problems. Nor does it resolve many difficult questions raised. The issues require more thought on technical, strategic, and political levels. Our first approach to this problem raises more questions than it answers. Thus it becomes important to clarify the nature and limited aims of our study and its proper role in a report on crisis preparations. This is done in Section A.

Section A. Orientation

The remaining sections of this report have limited objectives. The fact that they cover many (but not all) of the aspects of enormous evacuations, and in so doing make many uncertain estimates resting on little relevant experience, emphasizes the importance of making our objectives very clear. It is far too easy to assume that a study of substantial cost involving diverse experts and resulting in charts and tables is one which, if not correct, is not far wrong. This assumption may prove to be right in this case but it is not yet warranted. In the first place, the feasibility under various conditions of the evacuations discussed can never be incontrovertibly established. One may become more certain that an evacuation will succeed in a particular context or set of contexts but there will always remain uncertainties caused by weather, behavior of individuals, size and timing of an attack, and so on. Often it is easier than one would expect to ascertain what is likely and what is not; the behavior of crowds is predicted with surprising unanimity by those experts who have studied the matter, the capacity of transportation facilities is surprisingly large, the weather seems rarely to show a dramatic hampering quality. In view of these facts the possibility of substantial failure may be diminished but never completely removed.

Besides the difficulties inherent in predicting an operation of this size, there are the problems of estimating what can be estimated. Is 1,500 cars per lane per hour a suitable measure of road capacity under the strained conditions envisaged, or would 1,000 be a more appropriate number? What kind of fallout protection can average (and slower than average) citizens construct in a short time? These and similar questions have led to disagreements among the authors.

The kinds of difficulties just discussed are sobering. Millions of lives are at stake in these evacuations. Evacuations, under the best conditions, are very difficult feats. Some lives would be lost in any evacuation even if an attack never materialized--at least proportionate to casualties of holiday weekends. It will never be certain that an evacuation is necessary and one cannot prove that an evacuation will not tend to induce the thermonuclear disaster which it tries to avoid or mitigate. Such possibilities deserve and demand great study. This

report is not sufficiently comprehensive to support recommendations or more than some very tentative conclusions. Its goals are (1) to discuss methods and to construct illustrative examples, and (2) to ascertain whether some particular difficulties and simple combinations of them are insurmountable.

First and foremost this report investigates the methods and uses some of the techniques which should be involved in a more detailed study. In doing so it constructs examples of evacuations. These examples are in part based on arbitrary choices. They do not provide a basis for deciding what role evacuation should play in a national posture. On the other hand, the way that evacuation should be examined in more detailed reports, the techniques which will be useful, the kinds of experts who must be involved, and the way that alternative options should be formulated for decision-makers are proper subjects of this study. Thus, to the extent that method is our subject, our examples are mainly means of conveying certain lessons. These lessons cannot be taught in an insulated analogy. Our examples rightly reflect as much of reality as we could describe in the time we had.

In fact, our second goal demands this. There are many different obstacles which must be surmounted in evacuations involving millions of people, and almost any one of them might be termed by many as insurmountable. We found it quite easy to show that this is probably not the case as will be seen in several instances. In fact, we did not encounter a crucial element for which no substitute could be offered to make an evacuation feasible. For example, a shortage of transportation could be met by jettisoning freight and by overcrowding. Should overcrowding become too great, additional demands would be placed on the command and control procedures to maintain a workable passenger density. Preparations can be made in advance--cadres trained, and plans arranged--even practice runs could be included in the plans.

No single factor seems to make evacuation feasible and we consider it unlikely that any factor will be found to make evacuation infeasible. Conclusions and judgments will have to be based upon many factors as well as upon estimates and suppositions concerning many more. A final judgment on whether a particular type of evacuation is fully feasible is indeed difficult to reach. To say that a particular evacuation is definitely feasible requires that no unknown or innocent-looking difficulty be ignored as well as acceptance at face value of many difficult estimates. On the other hand, to say flatly that a difficult evacuation is not feasible would cast doubt on the ingenuity of our successors. Actually, neither statement can be made with great assurance.

We first discussed our assertions concerning method. In successive sections, the report points up many difficulties involved in supplying shelters, food, transportation, reception areas, and medical care against an uncertain distribution of fallout. Various methods were employed in the separate investigations underlying the individual sections. These range from experiments with mice to judge the effects of radioactivity on man to complicated computations of seasonal winds which enable one to identify areas likely to be somewhat more free from fallout than others. The results of the methods used by individual experts are cited in this report, but no systematic effort to judge their accuracy was made. However, attempts are made in each section to disclose the obvious uncertainties which exist in the existing body of knowledge. More detailed studies must delve further into these uncertainties in order to develop more reliable data. The most recent results concerning the percentage of radioactivity carried by the smaller particles and on their rate of fall seem to be of great importance. The state of mind of citizens in a particular crisis considered may be no less important. Even though the studies have been done by experts, this report could not convey sufficient certainty to convince a decision-maker to adopt any particular course. The separate aspects of a real evacuation are interrelated and as detailed as possible. Thus described an evacuation situation will be more than a disjointed collection of treatises on different facets of evacuation.

A more satisfactory method of attacking the problem might be to imagine a crisis situation in as much detail as possible. This situation might be a likely one--as likely as an imagined crisis can be--but this is not necessary. An interdisciplinary group might then attack the difficulties as if it were facing a real situation. This may at first sight be considered a very limited and peculiar goal. Since many situations may arise, such preoccupation with a single one may seem pointless. Nevertheless, there are real advantages which might be summarized as follows:

1. To the extent that it is possible to judge evacuation plans as feasible or infeasible, such judgments cannot be made without taking into account very concrete and particular investigations. To imagine a real situation and to plan in accordance with it is as close as one can come to the test of experience. Admittedly, imagination is a poor substitute for reality, but it is far superior in discussing feasibility to planning abstractly for a large number of contingencies.

2. Many crucial difficulties in real situations would not come to anyone's attention without trying to think in concrete terms. Such thinking is best done in a context or in the development of a specific context. General considerations typically lead to other general considerations and real difficulties are thus submerged. Planning in the light of a particular situation provides at least some protection against error.

3. If one accepts the principle that a single investigation of a single factor has little chance of demonstrating feasibility or infeasibility, the workability of a plan can be determined only by considering trade-offs between elements of the plan. These trade-offs can only exist within the confines of a single situation! The more specifically a situation is delineated, the more carefully the trade-offs may be considered and the clearer become the principles on which they are based.

4. When a particular "concrete" situation has been thought through and discussed at length, it is not so difficult to treat a large class of other similar cases. In these other cases the methods required are often comparable and the differences in proportions not difficult to compensate for.

A "scenario"--a hypothetical case story--is often a useful device for describing a future situation in enough detail to raise important questions which might otherwise elude even a scenario writer.

It is clear that discussions involving a particular scenario are not enough. Some situations are qualitatively different from others. They may differ in their political and geographical setting or in the amount of advance preparation or otherwise. Such very different classes of situations all deserve close treatment directed at a typical member. A corresponding group of studies would go some distance toward:

1. Giving a decision-maker a sense that particular courses of action were desirable and conveying an idea of the associated uncertainties.

2. Increasing the chances that a particular real situation was sufficiently like one studied to allow valid conclusions about the former to be drawn from the latter.

Such studies would not, however, by themselves allow for more than very wooden and rigid replies to a dynamic and changing world. Much more flexibility is required in dealing with the fast-moving situations represented by crises. This flexibility resides in the ability to move as circumstances dictate from one action to another without excessive loss.

Typically one pays in some way for the ability at future time to change one's freedom of action. For example, the destruction of the contents of boxcars provides empty conveyances which begin to play an important role in evacuating people two days after the decision to jettison their goods. In these two days the need for these boxcars may increase or decrease but the cost in destruction of goods is paid in advance. In tense periods time is often short and small preparations, if only in the form of existing paper plans, may make a substantial difference in the feasibility of quick action.

Since every action taken is a change from or successor to some other, the importance of placing the seeds of future action in the works of present actions is obvious. No other soil exists. Furthermore, a prudent man insures himself against unnecessary risks when the cost is reasonable. If a crisis may take successively different forms and require difficult shifts in position, one tries not to have to start each new effort from "scratch" even at the cost of wasting preparations. Such hedging should buy not only the ability to face a situation differing from the present one, but also the capacity to phase the old plans efficiently into the new ones.

The examples of evacuations which are discussed show this sort of hedging. The two-day evacuation would not scatter the population into only slightly less dangerous areas. It would hedge against the possibility that an attack may not arrive in two days and that an unscattered urban population would be easier to move to the safer reception areas during the remainder of a week. However, even if this possibility should occur, the final distribution in the reception areas would be very uneven. The one week evacuation would not proceed as fast as possible but by a more measured pace a population distribution would seem more capable of being maintained in an uncertain waiting period. Risks are measured in lives when the evacuation is purposely slowed and the gains are measured in days when the resulting evacuation is more stable. This trade-off preserves flexibility at some cost and is appropriate to a situation in which war does not seem so imminent as to make the trade ridiculous. The two-day evacuation is seen as appropriate to a qualitatively different situation in which war seems so close that little consideration should be given to a final distribution of evacuees after a week. In the alternative plans we have tried to show hedging against uncertainty, exploiting opportunities, and recognizing the branch points at which choices must be made. Our examples of alternatives should be provided to decision-makers only after more detailed consideration.

Besides discussing method and constructing illustrative examples, our second goal has been to show that certain anticipated difficulties are, at least by themselves or in combination with a few other simple conditions, not insurmountable. In a week, it seems that there is sufficient transportation to move 40,000,000 inhabitants in the northeast area into reception areas in that region. With sufficient time and equipment, it seems feasible for them to construct basement shelters of some value against the kind of attack which might be possible in the middle or late sixties. If preparations are made, sufficient food might be available from grain surpluses to allow the evacuees to survive the attack. Such tentative considerations constitute easy answers appropriate to simple objections. More detailed studies will be needed to establish the reasonableness of conducting strategic evacuations of this order in the face of mixed conditions and less than desirable preparations. We stress that these plans are primarily paper plans. Whether particular evacuations, including the ones discussed here, "make sense" is another and more difficult question. What degree of bad weather may become the last straw for an already difficult two-day or one-week extended evacuation cannot be completely settled by our discussion of weather. At the evacuations increase in difficulty, the number or variety of contexts in which the movement can succeed diminish.

Section B. Evacuation and Reception AreasIntroduction

The examples of evacuation which will be discussed are based for the most part on an assumed type and size of attack. The kind of attack assumed determines the areas suited for reception areas in the light of fallout, radiation exposure, and protection factors. Under desperate circumstances in which little time or bad weather might put certain areas beyond reach, other areas might be considered suitable to the occasion. Such factors are not considered in the plans presented here. Our reception areas are the same for all of our alternative evacuations. When time is short and enough movement to reach the fixed reception areas is impossible, our plans call for certain areas to improvise shelter and hope for sufficient relaxation of tension to permit subsequent movement or to void its necessity. People are not moved into these "stationary" areas in the evacuation.

In setting up different plans for different circumstances, there is something to be said for fixing reception areas in spite of some drawbacks. On the one hand, plans should be kept simple and similar without many different areas for different contingencies. Furthermore, without a sizeable increase in relative safety to be gained by movement, it does not seem worthwhile to risk movement on roads or rails. Thus if an area seems only slightly less dangerous it may not be worthwhile to consider it. The degree to which one wants to spread reception area preparations thinly among various areas is also an issue. On the other hand, the attack threatened is never in fact specified and areas which seem only somewhat less dangerous may turn out to be considerably safer or more dangerous. In any case, for the purposes of this report, the discussion which follows is used to determine fixed reception areas for all the situations later discussed. These are described in Appendix B-1. The evacuation and stationary areas which are appropriate to individual plans are discussed in the section appropriate to each plan and are shown in Figures D-1, D-8, and D-12.

B. 1 Choice of Evacuation and Reception Areas

The choice of evacuation and reception areas should take the following into account: (1) the type and magnitude of attacks expected; (2) the distribution of fallout and the blast protection existing or assumed constructable; (3) the radiation dose considered "tolerable" (4) the location of transportation facilities; (5) the distribution of housing; (6) the number of people who must be

evacuated; (7) the availability of water and food; and (8) the weather which can be expected in different areas at different times. These and other factors must be weighed together. Thus in some cases we use remote reception areas calculated to reduce radiation exposure for large numbers of persons even though they may be subjected to greater crowding.

A strategic evacuation is usually thought of as a movement away from target areas into areas of relative safety. If the population itself should be considered a target, an evacuation would only shift the target areas and thus afford little protection if the enemy knew where to aim and could retarget his attack. In the Northeastern United States there would be a difference between an evacuation designed to make attacks against the evacuated population difficult and one designed to minimize the effects of likely attacks against either military or population centers or both. However, under any new population distribution, military targets and current population centers (which are invariably industrial centers) will almost surely remain desirable targets. Furthermore, it is difficult to rationalize attacks against an evacuated population since they serve no immediate military purpose and represent purposeless killing. Therefore, the reception areas were not chosen to minimize the effects of an attack against an evacuated population. On the other hand, it can be argued that the one-week evacuation represents, within the geographical limits of the Northeast, a reasonable way to hedge against population attacks if in fact such hedging can be done at all under this constraint. In Section D.5, the number of megatons necessary to destroy large segments of the evacuated population is discussed. There we conclude that 250 megatons diverted to population attacks will destroy 15% to 60% of the total population, depending on preparations.

It is important in planning to discuss what attacks can be expected to follow the evacuation, primarily because of radioactive fallout. Since an empty city may still become a target, one should use the fallout from an attack on that city as determining certain unacceptably radioactive areas outside the city where people should not be sent. The evacuations discussed here assume that attacks may be made upon military and industrial targets quite independently of the success of evacuation. Hence, the potential fallout from city attacks is considered a crucial factor.

B.2 Magnitude of Attacks

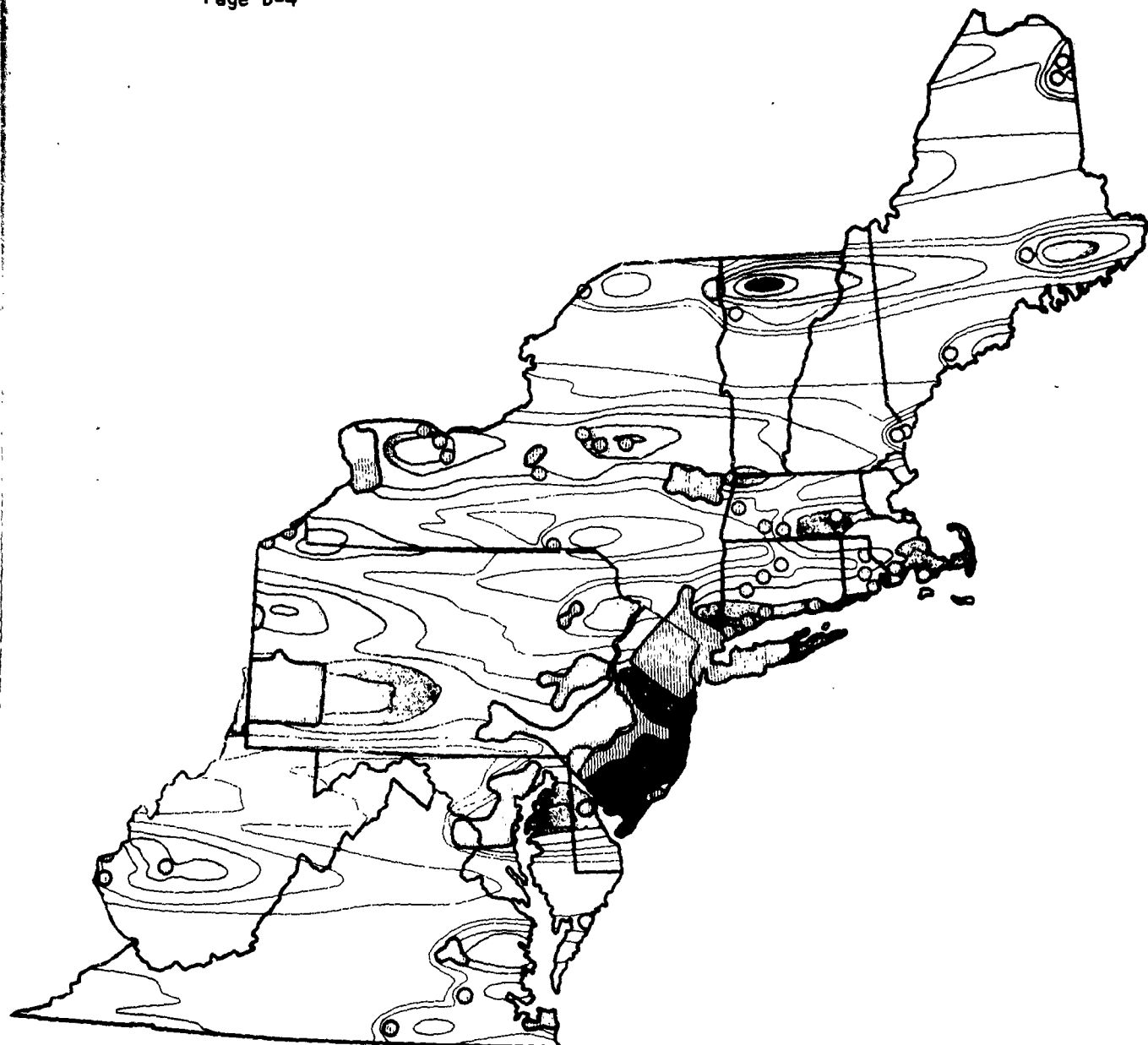
One must be guided by some estimate of how many military and industrial targets might be attacked and how heavily. Considering the length of time necessary to work out a dependable evacuation in

complete detail and the rapid progress of the arms race, it does not seem desirable to base our plans on probabilities existing today. We have concerned ourselves instead with the feasibility of an evacuation several years from now. Specifically we have thought in terms of an attack of about 4,000 MT, distributed across the country as worked out in Shelter From Fallout, prepared by Technical Operations Incorporated. (1) This attack has the virtue of being large enough to remove many random targeting choices which would be associated with having fewer weapons available. That part of the attack relevant to our evacuation is shown in Figure B-1 which is a composite of two maps from The Probable Fallout Threat Over The U.S. (2)

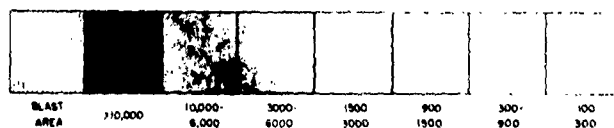
The attack assigns in excess of 100 MT to each of three areas--New York City, Philadelphia, and Pittsburgh--and more than 30 MT to each five areas--Washington, Baltimore, Buffalo, Plattsburg (N.Y.) and the Albany-Schnectady-Troy complex. Other targets include Harrisburg, Lancaster, York, Wilkes-Barre, Scranton, Allentown, Erie, and Reading, in Pennsylvania; Newburgh, Utica, Syracuse, Rochester, Binghamton, Niagara Falls, and the St. Lawrence Seaway, in New York; Lakehurst, Atlantic City, Wrightstown, and Trenton, in New Jersey; Charleston, Huntington, Richmond, Norfolk, Hampton, and Portsmouth, and the John Kerr Dam, in Virginia and West Virginia. The total assumed attack in the Northeast involves something in excess of 1000 MT, which is calculated at two-thirds fission material deposited in surface bursts.

B. 3 Fallout

For such a specified attack what is the probable resulting fallout? Variations in wind direction can affect the fallout distribution by very large factors. The Northeastern United States has a wind pattern which is independent of the season to a greater degree than any other part of the U.S. Nevertheless there is great variability in wind direction and speed. The prediction of this variability is most difficult. Seasonal predictions are about as good as one can find for planning purposes, but they are subject to considerable fluctuations from year to year. It is almost certain that as a result of wind variations from the average, many people will receive as much (though usually not more) fallout as they would have received if they had stayed at home. Since evacuation areas are always overcrowded, by factors of 5 to 10 in different cases and at different places, it is very important that this effect be minimized. We have endeavored to do this. We have, therefore, sometimes ignored areas of low fallout under average winds if small variations in wind will greatly increase their radioactivity and if it is possible in the time assumed to remove the



SCALE IN MILES
0 50 100 150 200



BLAST AREA >10,000 10,000-6,000 3,000-6,000 1,500-3,000 900-1,500 300-900 100-300

TWO-DAY DOSE LEVELS

Figure B-1

population to a place of greater safety. The fallout maps used were drawn up by Technical Operations Incorporated. (3)

B. 4 Radiation Exposure

We next discuss what constitutes a tolerable level of radiation exposure and what protection might be assumed in certain areas. Most experts believe that 50% of the population will die if they receive 450r in a few days. The rate of survival under cumulative doses over longer periods of time is more controversial.

Shelters will be required in all areas of the Northeast and thus the length of time to be spent in them, the number, frequency, and timing of trips from them, the accuracy of dosimeters and the skill with which they are used and interpreted become important considerations. The success and timing of decontamination procedures will also be at issue. Furthermore, there will be a high correlation between geographical location and radiation sickness since an inadequate shelter is, within the limits of biological variability, inadequate for all. This will lead to great difficulties in preparing for the survival of such groups, few members of which can be expected to make suitable recuperation efforts. These considerations have led us to aim for less than a 75r in two days or 100r in two weeks in the areas designated as reception areas, keeping in mind the kind of attack assumed. Later, population attacks are considered giving rise to much larger and often fatal doses.

B. 5 Protection Factors

Our evacuations involve all the states of OCDM regions one and two except Ohio and Kentucky. In all of these states except Virginia and West Virginia basements are estimated to be available in 90% of the housing (see Shelter From Fallout). (4) A basement can be expected to give a radiation reduction factor of 10 to 20 depending on its walls, its size, and the type of house above it. We have assumed that this kind of protection is readily available in all but two states. In those two states, Virginia and West Virginia, basements are available for about 56% of the population but this shortage is somewhat balanced by the fact that these two states would have a smaller fallout problem. A detailed development of the evacuations requires more information on the distribution of basements and more preparations in these two states for areas which lack basements.

In areas with basements it is possible, by piling about 7 inches of dirt on the first floor, sandbagging openings in the basements, piling some dirt against the sides of the building, and taking some precautions against drift of fallout accumulating in nearby low areas, to attain a protection factor of 40. We have for the most part assumed that this factor is available in choosing reception areas. Though it is possible to find a somewhat diminished area in which a protection factor of 10 might give rise to no more than a 90r two-day dose, this area is very susceptible to wind changes which would raise the dose by about a factor of 3. Furthermore, the difficulties and risks associated with getting people to the reception areas seem to demand a greater degree of final protection than one heavily dependent on average winds. It also seems logical to postulate preparations in the reception area which are more consistent with the other evacuation efforts (stockpiling, traffic control, etc.) than is indicated by very minimal protection. In short, it does not seem reasonable to plan an evacuation in the Northeastern United States against an attack of size and type assumed without aiming at a protection factor of about 40 partly as protection against wind variations. (Virginia and West Virginia are exceptions.)

The areas considered suitable under these conditions, keeping in mind the problems of wind variations, are shown in Figure D-1. The suitability of these reception areas should be evaluated in the light of some other conditions mentioned at the outset. The over-crowding involved in this choice of areas is clear when we see that the population in the reception areas would be increased by large factors, e.g. 7, under the plans set forth here. A further decrease in the size of reception areas seems highly undesirable. For example, in most areas of the country (including the Northeast, there are about 3.3 persons in a household and, if basements are assumed in about 90% of the homes in both urban and rural areas, we would have over 25 persons to a basement in the northern states in the one-week evacuation). Without restricting ourselves to fewer regions therefore we have endeavored to solve or assumed solved the problems of food, water, location of transport, weather, etc. by a combination of planning, rationing, stockpiling, choice of modes of transportation in different regions, and separate discussion of the difficulties which will be associated with bad weather and other considerations. Specifically, for example, we have not excluded the use of Maine, northern New York State, and the Appalachian areas, which will make evacuation difficult in winter, simply because their exclusion would so drastically reduce the available reception areas.

APPENDIX B-1

DESCRIPTION OF THE RECEPTION AREAS--ALL EVACUATIONS

<u>Area Number</u>	<u>Area Name</u>
R-1	MAINE R-1 composed of Maine, except E-3, E-4, and southern York County.
R-2	NEW HAMPSHIRE R-2 composed of New Hampshire, except Coos County.
R-3	VERMONT R-3 composed of Vermont, except E-5.
R-4	NORTHEASTERN NEW YORK R-4 composed of: St. Lawrence County; Franklin County; Western Clinton County; Jefferson County; Lewis County; northern Herkimer County; northern Hamilton County; Essex County; Oswego County; Warren County; Washington County.
R-5	SOUTHEASTERN NEW YORK R-5 composed of: Chenango County; Otsego County; Schoharie County; Delaware County; Greene County; Columbia County; Sullivan County; Ulster County; Dutchess County.
R-6	SOUTHWESTERN NEW YORK R-6 composed of: Chautauqua County; Cattaraugus County; Allegany County; Steuben County; Schuyler County; Chemung County; Tioga County; Tompkins County; Cortland County.
R-7	NORTHERN PENNSYLVANIA R-7 composed of: Warren County; McKean County; Potter County; Tioga County; Bradford County; Forest County; Elk County; Cameron County; Clinton County; Lycoming County; Sullivan County; Jefferson County; Clearfield County; Centre County; Union County; Snyder County; Montour County; Columbia County; Northumberland County.

<u>Area Number</u>	<u>Area Name</u>
R-8	WEST VIRGINIA R-8 composed of: West Virginia, except E-17 and E-18.
R-9	VIRGINIA R-9 composed of: Virginia except E-14, E-15, E-16, Arlington, Arlington County, Fairfax County.

FOOTNOTES TO SECTION B

1. E. D. Callahan, L. Rosenblum, J. R. Coombe, Shelter From Fallout, (rev.). Prepared for Office of Civil Defense Mobilization, April 7, 1961, prepared by Technical Operations, Inc., Burlington, Mass.
2. E. D. Callahan, et al, The Probable Fallout Threat Over The United States, prepared for Office of Civil Defense Mobilization, December 1, 1960, prepared by Technical Operations, Inc., Burlington, Mass.
3. E. D. Callahan, et al, The Probable Fallout Threat Over The United States.
4. Callahan, Rosenblum, Coombe, Shelter From Fallout.

Section C. Transportation

The evacuations described here rely on automobiles to carry about 75 per cent of the evacuees. However, in the densely populated New York-New Jersey-Philadelphia area the lack of roads into the reception areas dictates a considerable reliance on including boxcars. Buses and trucks and rail passenger cars play a role in the one-month escalation and, in the shorter evacuations, rail passenger cars are used for hospital trains. The use of waterways and barges is not considered, partly because the waterways in the Northeast do not lead into the right areas and partly because they are frozen for several months a year. Figure C-1 summarizes the use of transportation in the plans considered.

C.1 Evacuation by Automobile

Evacuation by automobile has been studied in the past during a period in which a few hours of warning might be expected between the time a war might start and the cities come under attack. These studies generally discuss the rate at which city population can travel 15, 25, and 40 mile distances to reception areas. The major problems indicated by the studies involved the number of roads leading out of the city, the number of cars in the city, the supply of gasoline, and the question of restricting the access to the roads so that all lanes could be used for outbound traffic. Naturally some of these problems are still involved in questions of strategic evacuation, but the relative importance is different. The distances involved in this study usually require at least one refueling, especially if much bumper to bumper, stop and go driving is expected to reduce the gasoline mileage. The problems of fuel are not completely answered by asking people to keep their tanks at least half full--the previous solution. The length of driving time, the kinds of road used, the emergency atmosphere, are all somewhat changed.

The central problems involved in strategic evacuation by automobile are: (1) the capacity of the road system to distant reception areas; (2) the number of people per car; (3) the refueling of the automobiles; (4) the breakdown rate; and (5) the weather. Some estimates are made concerning these matters. However, there are many aspects of these questions which are difficult to estimate. Practice drills might be required as a basis for predictions on many points. Such problems might involve the following considerations:

Figure C-1

TRANSPORTATION SUMMARY OF EVACUATIONS

<u>EVACUATIONS</u>	<u>TOTAL POPU- LATION OF EVAC. AREA (MILLIONS)</u>	<u>TOTAL POPU- LATION TO BE EVACUATED (MILLIONS)</u>	<u>NUMBER OF PEOPLE BY CAR (MILLIONS)</u>	<u>PER CENT OF PEOPLE BY CAR</u>	<u>NUMBER OF PEOPLE BY TRAIN (MILLIONS)</u>	<u>PER CENT OF PEOPLE BY TRAIN</u>
TWO-DAY	25.54	22.99	16.54	72	2.0	9
TWO-DAY EXTENDED	47.02	42.32	33.78	80	8.5	20
ONE-WEEK	47.02	42.32	32.47	77	9.8	23
ONE-MONTH	36.86	33.17	27.20	82	5.98	18

1. Many cars can be expected to be severely overloaded with people and possessions of various kinds. These overloaded cars increase the chances of various kinds of accidents or breakdowns.
2. Many old cars will be brought into use which are so unreliable that they would not normally be taken on long trips.
3. Drivers can be expected to be nervous and tired and, often, to be driving under difficult conditions.
4. In summer cars may overheat and stall when crowded conditions develop and stopping is frequent and prolonged.
5. Unusually serious traffic jams can be expected because of crowding, unfamiliarity with roads, and blocking by disabled cars, especially if command and control procedures are ineffective.
6. Long trips will require occasional stops to rest, eat, or for sanitary reasons and this may have a disturbing effect on the traffic as the cars pull on and off the road.

The evacuation routes used are shown in Figure C-2 and are described in Appendix C-1. They represent the main arteries. For example an evacuation route used for the most part by New York City residents may be drawn as beginning at the Susquehanna River if it is believed that there is sufficient road capacity between New York City and that river to keep the evacuation route filled. The routes drawn typically terminate somewhat inside the reception areas. The dispersion routes which are required are not shown since identifying them calls for plans this report developed.

C.1.1 Lane Capacity

Official control of the road sufficient to close off and open up access to the evacuation routes as seems desirable is assumed. It seems difficult to estimate the flow. It requires a high degree of control to keep cars flowing in all, or almost all, lanes in the same direction. We assume that this is possible. In these cases, local and cross traffic has to be disrupted to a considerable degree. The risk of serious accidents exists and a certain amount of confusion can be expected. Furthermore, one probably must resort to abandoning cars which break down or run out of gas, since there will be little opportunity to bring up emergency vehicles. The use of both lanes of two lane roads, day and night, is an important part of a two-day or one-week evacuation. Having postulated a certain degree of command and control in the use of the roads, we have assumed that the roads used in this study, which are for the most part state routes or better roads, will be able to handle 1,000 cars per lane per hour. This figure is an average of the capacities of good and poor roads under evacuation conditions as discussed in A Preliminary Report on Highway Need for Civil Defense.⁽¹⁾ Of course the roads in the vicinity of metropolitan areas are considerably better and with traffic flowing smoothly, might be expected to carry 1,500 cars per lane per hour, but the evacuation routes are sufficiently long to make it seem reasonable to apply the lower figure more appropriate to average roads. This estimate is considered low enough, however, to make some allowance for some of the delaying

factors. On the other hand, where evacuation routes cross difficult terrain the flow may be significantly smaller even in good weather.

In a one-month evacuation 30% of the population in the evacuation areas would leave over a period of 13 days, using the normal lanes at a rate not too different from normal traffic or about 6,250 cars per lane per day.

C.1.2 Occupancy of Cars

It is assumed that the average car involved in the evacuations will be carrying four people. The average size of households, i.e. persons or groups occupying the same living quarters, is 3.3, and presumably these people will want to ride together although, in some instances where two cars are owned, there may be a desire to take both. Thirteen per cent of households have this multi-car option. In any case, without controls many cars will have only one or two people in them. In some situations our plan makes it imperative that our car occupancy assumption be realized. This is especially important, for example, along the evacuation routes from the New York-New Jersey-Philadelphia area into northern Pennsylvania in the one-week evacuation. In desperate situations, such as the two-day evacuation very crowded cars might be desirable. In any case, our computations always assume an average of four persons to a car.

In order to achieve this average, one might use checkpoints at which people would be assembled to be assigned to passing cars with less than four passengers. Also, the occupants of two or more cars might be assigned to a single one. However, in evacuations which proceed over several days, there will be a strong tendency to fill cars with valuable and useful commodities since there will seem to be enough time for packing. Merging carloads will, in this context, be a drastic measure involving at best considerable transfers and at worst jettisoning of goods of high personal value. There is also considerable utility to having people take clothes, food, and other essentials with them and considerable difficulty involved in getting people to part with goods they deem desirable. In the New York-Philadelphia-New Jersey area there are in excess of 5,000,000 cars and the one-week evacuation, for example, calls for using about half of them to move about 10,000,000 people by car. Detailed instructions would have to specify why one-half of the available cars should be left behind. In particular, one might specify exactly which parts of an area would be emptied by train, the methods of deciding which cars, particularly the late models, would be taken, and the controls to be used in filling these cars. The mechanisms for such instructions are left for more complete studies.

At a rate of four persons per car and 1000 cars per lane per hour 96,000 people can be evacuated over one lane in one day. We will use for convenience a round figure of 100,000 involving only a small upward adjustment in average occupancy or rate of movement.

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Figure C-2

1

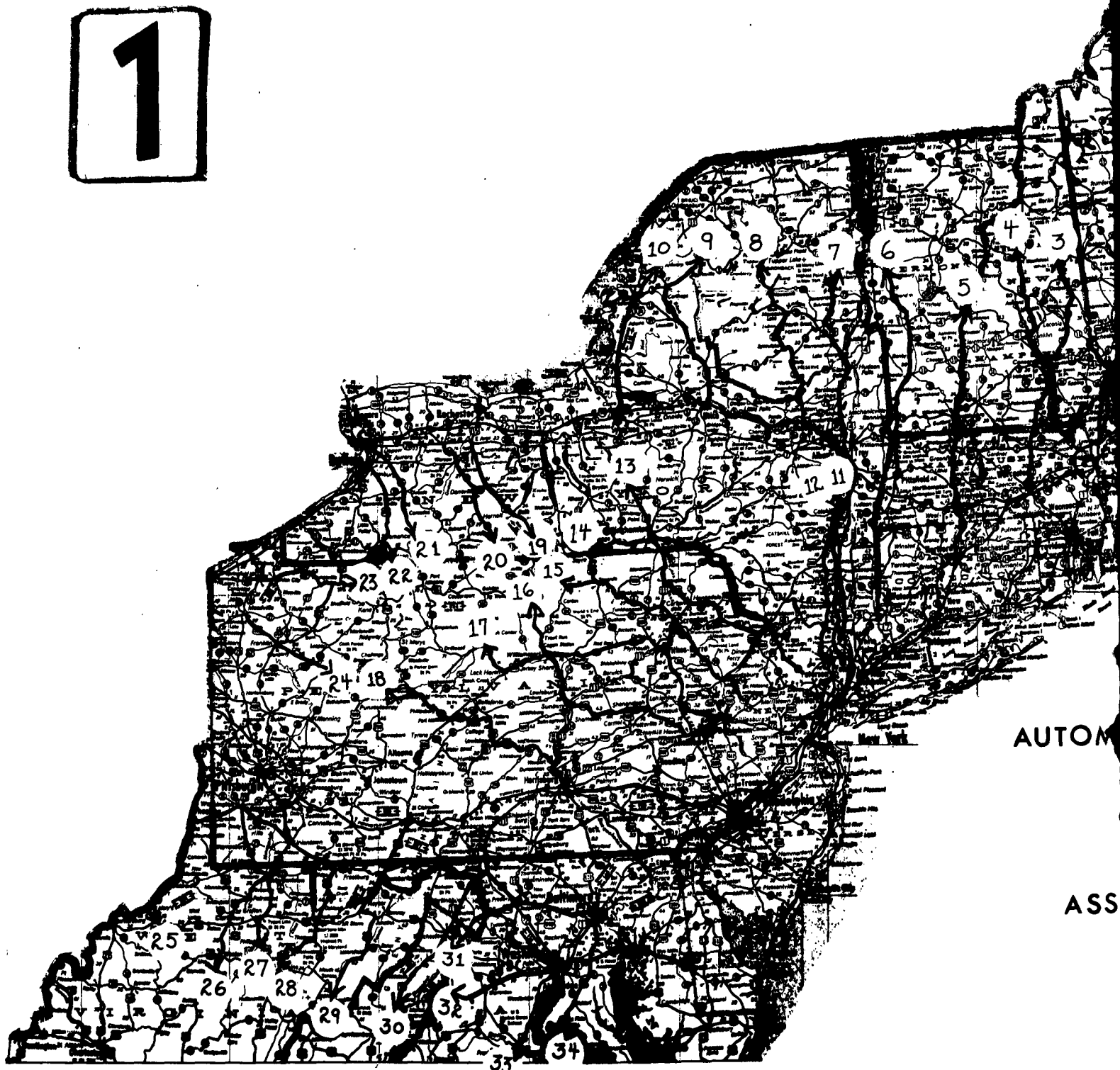
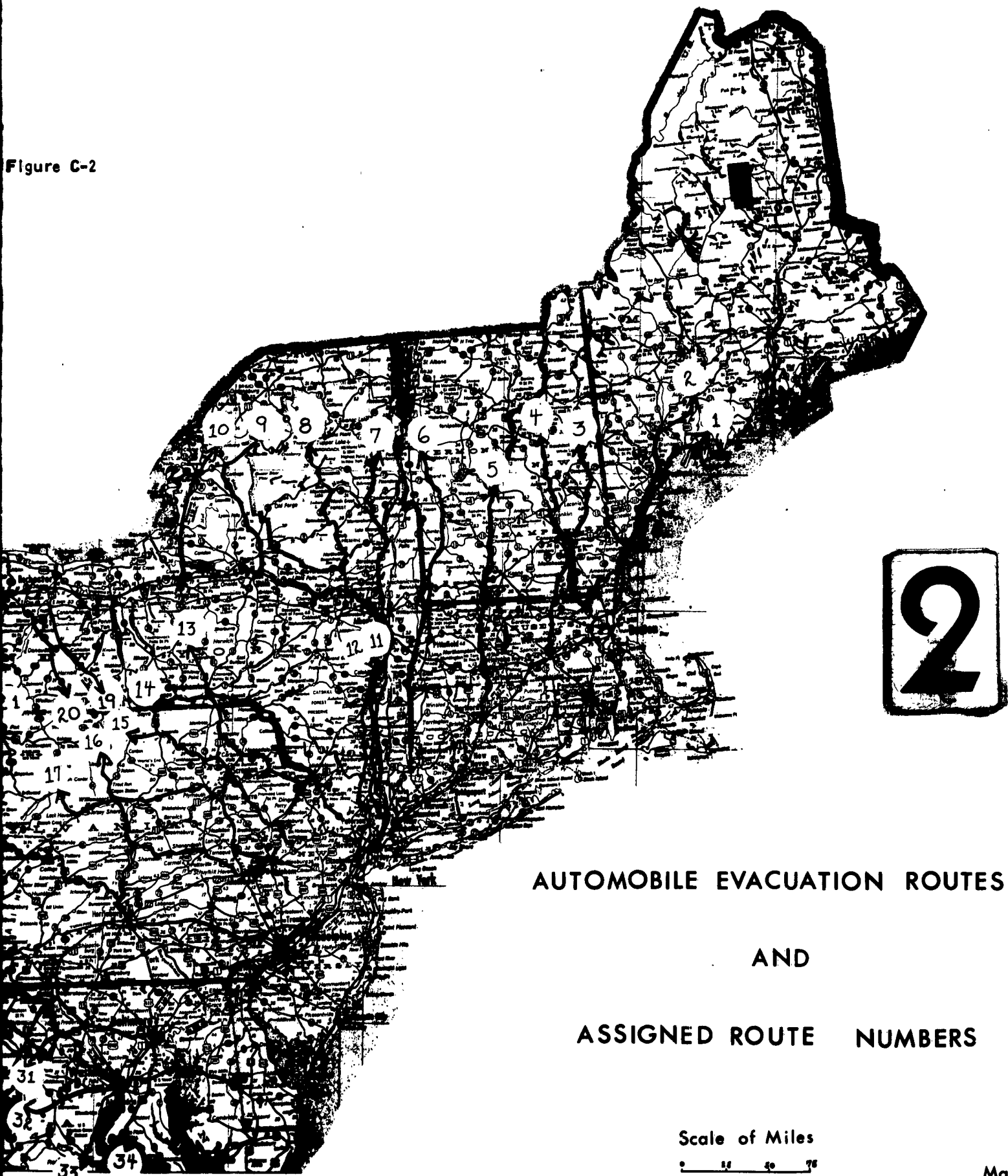


Figure C-2



C.1.3 Refueling

If large numbers of people are to be moved by car from the heavily populated areas around New York, Philadelphia, and Baltimore, refueling of vehicles is essential. The average gas mileage for private automobiles over the whole country driven under all conditions is about 14 miles per gallon. However, stop and go driving, under congested conditions, will result in considerably lower mileage--probably as low as 8 miles a gallon. In extreme cases, many cars will expend most of their gasoline just by idling during traffic jams. Attempts to ameliorate this extreme case by turning the engine on and off may not be practical under certain winter or summer conditions. Another important factor in refueling is the size of the gas tanks. These vary from 12 to 20 gallons for the most part, with the cars capable of better mileage having smaller tanks. Though it is obviously impossible to capsuleize so many different possible traffic conditions in one number, we expect automobiles to drive from 150 to 200 miles on a full tank of gas under evacuation conditions. For compact cars this assumes gas consumption at 12 to 17 miles per gallon.

There are many different possible ways one might try to deal with the fuel problem. Car owners might be instructed to keep extra cans of gasoline in their garages to be ready for an evacuation trip, the number of cans depending on the distance to pre-assigned reception area. Alternatively, one might set up large emergency refueling stations along evacuation routes and stock them with large quantities of gasoline. (It seems likely, however, that there are enough pumps in existing gasoline stations along evacuation routes to pump the required gas, except possibly in the rural areas which the cars will enter last. At their highest rate of flow, some pumps deliver 15 gallons a minute, but ten to twelve is probably more likely as an average. Therefore, we assume that refueling takes $1\frac{1}{2}$ minutes per car. Thus if cars stopped for gasoline every 150 miles while traveling in both lanes of a two lane road at 1,000 cars per lane per hour, the 150 mile stretch of road would have to refuel 2,000 cars per hour. This requires 50 pumps, or 8 to 15 gas stations. In most areas there would be at least this many stations in 100 miles of roads. On turnpikes, stations might be as far apart as 30 miles, but with 8 to 30 pumps. These turnpkke stations might be required to service 4 or 5 lanes of evacuation traffic. On the other hand since the turnpikes are often nearer the cities the need for refueling may be relatively small. In many cases it will be necessary and desirable to direct cars off evacuation routes to reach nearby stations not on the route. Such problems have to be considered separately when drawing up a detailed plan identifying evacuation routes, surveying the number of pumps along each route, and estimating the possible traffic rather more precisely.

In those cases in which there are not enough service stations at appropriate points, the tank trucks which service the gasoline stations may be used if they are adapted for this purpose. Adapting them would cost about \$50 per truck to enable it to fill two cars at one time using gravity to induce the flow. The rate of transfer would be about five gallons per minute requiring three minutes per car on the average. Such trucks would be almost as efficient as service pumps. There is an additional drawback, however, petroleum trucks of 7 thousand gallon capacity would take about 12 hours to service this supply directly into cars in contrast to about half an hour to deliver their supply into service station tanks.

There are also, in the Northeast area, about 15,000 fuel oil trucks equipped with pressure pumps of about 25 gallons per minute. But the rate at which an automobile tank can vent air to receive the petroleum from such pumps becomes a limiting factor. Considering the experience of service stations in dealing with emergencies, it seems probably wise to rely on them for most refueling.

If drivers are to make intelligent decisions in spacing their refueling, they should be supplied a list of service stations in operation showing their location and distance from each other.

Finally the problem becomes one of keeping the gasoline stations supplied by available tank trucks. Gasoline stations of average size have a storage capacity of 8 to 12,000 gallons. These stations are serviced by tank trucks with an average capacity of about 5,000 gallons. If we imagine 2,000 cars per hour stopping along a 150 mile stretch of two lane road to ask for about 10 gallons each, we might expect to drain three 6 or 7,000 gallon tank trucks each hour. This indicates the need for many trucks to shuttle back and forth under difficult conditions. The number of trucks depends in part on the location of the gasoline stations with relation to storage tanks since this affects the turn around time. For this reason it will be very important to choose gasoline stations to be refilled which are accessible by roads other than the evacuation routes and which reduce the length of trips from supply tanks. There seems little doubt, however, that enough trucks exist to do the job. Fuel oil delivery trucks now available in the region considered account for a capacity of about 60,000,000 gallons and over-the-road petroleum tank vehicles for another 150,000,000 gallons. We might want 20 gallons delivered to each of 10,000,000 cars during a period of a week. Thus, if the trucks made one delivery a day, only one-seventh of the total capacity would be involved. In fact, however, under normal city conditions in certain areas, some trucks, working a 20-hour day, now make eight deliveries each day. Also, railway tank cars, holding about 10,000 gallons might usefully be placed on rail siding near service stations. The tank cars could fill tank trucks using gravity flow. Nor does there seem to be any

problem in finding enough gasoline on hand in bulk storage plants. These plants in New York State alone have a capacity for storing almost 500,000,000 gallons of gasoline and an equal amount could be stored in bulk plants of the other states involved. These matters need much closer consideration by the petroleum industry, but it seems likely that the appropriate plans could be made and carried out.

C.1.4 Vehicle Failures

If essentially all lanes of roads are to be used in one direction, it may be difficult to reach vehicles involved in accidents and breakdowns which will exaggerate the normal delays and subsidiary problems associated with these events. (It is presumed that disabled cars will be pushed off the road or onto the shoulders by the car behind whenever necessary and possible.) In order to remove the source of many breakdowns, older cars might be taken off the road at checkpoints. This could be a considerable problem if one expects that many old cars will be used, since 25% of all registered cars are more than eight years old. In determining measures to overcome this problem it is important to analyze breakdown in relation to age. Although data is difficult to find on this subject, it is interesting to note that the American Automobile Association made in excess of 65,000,000 calls in 1961. Figure C-3 lists the causes of breakdowns. The figures given in figure C-3 suggest some of the auto supplies that should be stockpiled in service stations along evacuation routes. Batteries, tires, and gasoline would take care of 25 to 50 per cent of these breakdowns.

Another way of looking at the breakdown problem is to examine the number of failures per miles driven. This is often quoted as one for every 10,000 vehicle miles, but the rate varies widely under different conditions. Experience on toll roads of different types vary from one every 6,000 to one every 50,000 vehicle miles.

It seems clear that one should expect a rate higher than the norm. Even at the normal rate of breakdown with the rates of travel assumed here (1,000 cars per lane per hour) one could expect an average of two breakdowns per hour over a ten mile stretch of two lane road if both lanes were used for evacuation. After choosing evacuation routes, it will be necessary to plan allocations of additional supplies of emergency parts and vehicles. Helicopters might be used to spot severe traffic jams. In general, some experiences of military transport would be more relevant than the procedures of service agencies whose operating cost is a major factor and which operate on a less urgent basis under normal conditions.

Figure C-3

Automobile Breakdown Experience

Battery, Electrical	16,541,000
Tire	12,746,000
Ignition	8,795,000
Tow and Wrecker	8,325,000
Stuck (mud, snow)	4,316,000
Starter	3,229,000
Out of gas	2,356,000
Carburetor	2,044,000
Brakes	903,000
Lock and key	755,000
Gas Line	723,000
Lights	176,000
<u>All others</u>	<u>4,127,000</u>
Total	65,036,000

C.1.5 Availability of Automobiles

In the United States there is one registered automobile for every three persons. In the Northeast area, 68% of households own a registered automobile. Figure C-4 indicates relevant statistics for leading counties in the Northeast area. In over a hundred leading U.S. counties only the five boroughs of New York City, with 5.9 persons per car, and Suffolk County containing Boston, Mass., with 4.5 persons per car, exceed the 4 person per car average which we have assumed. In the New York City area trains can be used for evacuations to such an extent that the lower automobile registrations need not be an obstacle. In evacuating Boston, however, some trucks and buses may have to be used in addition to trains. Assuming that 10% of the people are left behind as a skeleton force and that they would plan to leave last by rail transport, the difficulty in providing transportation would be further diminished.

Figure C-4

1960 Motor Vehicle Registrations in Leading U.S. Counties²

<u>County, Main City, State</u>	<u>County Registrations Cars</u>	<u>Persons Per Car</u>	<u>Households Per Car</u>
<u>5 Boroughs, N.Y., N.Y.</u>	<u>1,316,665</u>	<u>5.9</u>	<u>1.8</u>
<u>Phil., Phil., Pa.</u>	<u>473,269</u>	<u>4.1</u>	<u>1.3</u>
<u>Baltimore, Balt., Md.</u>	<u>363,267</u>	<u>3.9</u>	<u>1.1</u>
<u>Middleses, Camb., Mass</u>	<u>376,254</u>	<u>3.2</u>	<u>.9</u>
<u>Erie, Buffalo, N.Y.</u>	<u>328,346</u>	<u>3.2</u>	<u>1.0</u>
<u>Essex, Newark, N.J.</u>	<u>294,705</u>	<u>3.1</u>	<u>1.0</u>
<u>Westchester, Yonkers, N.Y.</u>	<u>299,489</u>	<u>2.7</u>	<u>.8</u>
<u>Suffolk, Boston, Mass.</u>	<u>173,145</u>	<u>4.5</u>	<u>1.4</u>
<u>D. C., Washington</u>	<u>250,254</u>	<u>3.0</u>	<u>1.0</u>
<u>Hartford, Hartford, Connecticut</u>	<u>277,705</u>	<u>3.0</u>	<u>.8</u>
<u>New Haven, N. H., Connecticut</u>	<u>216,044</u>	<u>3.0</u>	<u>.9</u>
<u>Hudson, Jersey City, N. J.</u>	<u>152,207</u>	<u>4.0</u>	<u>1.3</u>
<u>Monroe, Rochester, N.Y.</u>	<u>194,266</u>	<u>3.0</u>	<u>.9</u>
<u>Worcester, Worcester, Mass.</u>	<u>181,504</u>	<u>3.2</u>	<u>.9</u>
<u>Providence, Providence, R. I.</u>	<u>176,886</u>	<u>3.2</u>	<u>1.0</u>
<u>Henrico, Richmond, Va.</u>	<u>118,040</u>	<u>2.8</u>	<u>.8</u>
<u>Norfolk, Norfolk, Va.</u>	<u>124,166</u>	<u>2.6</u>	<u>1.2</u>
<u>Lancaster, Lancaster, Pa.</u>	<u>95,537</u>	<u>2.9</u>	<u>.8</u>
<u>Mercer, Trenton, N.J.</u>	<u>90,355</u>	<u>2.9</u>	<u>.8</u>
<u>Kanawha, Charleston, W. Va.</u>	<u>81,675</u>	<u>3.1</u>	<u>.9</u>

In general then, enough automobiles seem to be available to support the evacuation plans considered here. However, more detailed plans will require a closer examination of the distribution of cars, and in particular with respect to day and night periods. Car distribution defects may have to be met by buses and trucks and, in some areas, by operating shuttles between city centers and evacuation areas.

C.2 Evacuation by Rail

Introduction

Evacuation by rail has many advantages over evacuation by car. Unlike the situation in automobile evacuation in which many drivers of varying competence and experience and unfamiliarity with roads are pressed into service, the evacuation by rail is performed by professionals who are trained in their work and used to difficulties and improvisation. The relatively small number of people who must be trained and depended upon to do the evacuation is a great advantage. Any indoctrination or education required is much easier to perform than is the case with automobiles. Nevertheless, an important preparation for evacuation by rail may well be the qualifying of some train and engine crews on routes required for evacuation which are foreign to them. This qualification requires several trips over such routes. Since each train with 100 boxcars may carry 6,500 persons, the preparation of engineers represents a relatively inexpensive and important measure. In case of a shortage of engineers, there are several ways to keep the trains moving. First, the crews of trains which normally pass over selected roads are more or less capable of guiding engineers who may be unfamiliar with the road. While it would be preferable to allow only conductors and experienced firemen to do this, even brakemen might be capable of it. Considering the substitute personnel for each crew which regularly travels over a road, and the fact that five man crews are usual, we estimate that 3 to 6 times as many trains as normally pass over the road could be accommodated by using these trained men as pilots. This would require, of course, that many railroad men from other areas be drawn in to fill out the crews. Even using this technique of stretching out the trained men, one might find in some cases not enough qualified men on a particular line because its use in the evacuation might be disproportionately high compared with its ordinary commercial use. The number of men who would have to be qualified in these cases cannot be estimated without investigating all the lines scheduled for a final evacuation plan.

Since there are only about 3,500 rail passenger cars in the Northeast area, each seating about 75 persons, other types of railway cars would have to be used to carry evacuees if evacuation by rail is to perform a major role. Boxcars are considered in the evacuations to be discussed; in the desperate situations, such as the two-day evacuation, other kinds of railway cars might be used. Since the freight cars would be much more lightly loaded with people than with usual freight, the trains should be able to maintain high speeds even on grades.

In making our estimates on the capacity of the railroads to assist in evacuation we encountered several bottlenecks. Although the numbers associated with these bottlenecks are tentative, it seems likely that a more detailed study would show the situation qualitatively close to that portrayed here. One bottleneck seems to be the number of empty freight cars likely to be available. There would be sufficient engines, line capacity and crews but, over a period of a few days, there would be a shortage of empty boxcars. The evacuations which use boxcars always assume that loaded boxcars, if they are not emptied, are yarded or left standing on sidings and not delivered. In order to alleviate the shortage of freight cars one could have crews unloading the loaded boxcars and discarding the contents. Both of these possibilities are considered. In any case, we would anticipate a vast disruption of the transport pattern with subsequent delays in production and a dip in gross national product, not to speak of the loss of perishable products and of other freight.

In this section, independently of the evacuations to be described, the rail capacities, rail routes, and boxcars availability are described. Later, in discussing particular evacuations, the use of the rail network appropriate to each plan is discussed.

The evacuation by rail is postulated on the following assumptions:

1. The evacuees will be grouped by car assignments and will be supervised by "car wardens" who will direct their movement from their home district to their respective railroad cars.
2. Training runs will be made by car wardens in typical evacuee trains and CPXs of the movement will be held frequently by civil defense and railroad personnel.
3. Motive power assignments will be pre-planned (including transfer of engines between roads) and boxcar locations predicted.
4. Train make-up assignments will be pre-scheduled for yard crews and personnel assigned to these crews.

5. Train and engine road crew schedules will be developed beforehand and qualification runs conducted where foreign road assignments are necessary.
6. Evacuation traffic will have the highest movement priority.
7. The average boxcar turn around time (3) (for inventory requirement calculation purposes) is three days.
8. Adequate manpower to jettison contents of loaded boxcars will be available at appropriate locations if jettisoning is called for.
9. "Hospital trains" will be made up of baggage and passenger coaches.
10. Boxcars will hold 65 persons at about 7 square feet per person. Passenger cars will hold 100 persons each with 75 seated.
11. The typical evacuee train will average 100 cars and will run as a one destination block of cars with 20 minute rest stops every 3 hours.
12. The normal evacuee trains, composed of boxcars, will be loaded at freight yards on the outskirts of the city, for example on the New Jersey side of the Hudson River in the New York area.

Railway operations are discussed in Appendix C-2.

C.2.1 Available Rolling Stock

The evacuations discussed by rail are based on the use of boxcars, rail passenger cars, and baggage cars. In fact, other railway cars could be used if the situations were sufficiently desperate, as in the two-day plan. While some plans in the past have anticipated using hoppers, gons, and other cars, it must be remembered that the longer evacuation plans discussed here require substantially more time in these uncomfortable cars.

In the Interstate Commerce Commission Eastern District there are about 240,000 boxcars, and of these an estimated 120,000 are east of the Pennsylvania border. The estimates used here are restricted to the use of the latter boxcars and the boxcars in the Pocahontas Region which number about 33,000. If we assume that

of the available boxcars, 60% are loaded and 40% are empty, then about 60,000 empty cars would be at our disposal. Of these, about half would be in the Boston to Baltimore area (i.e., within a district, the border of which passes through Washington-Frederick-Lancaster-Reading-Allentown-Port Jervis-Newburgh-Springfield-Lowell-Portsmouth). These thirty thousand cars would be the most available. In a few days the contents of loaded boxcars might be jettisoned and these cars would then become available to move evacuees. The rate at which the boxcars might be loaded and dispatched is described in Figure C-5. At first the rate is determined entirely by the availability of boxcars but on the fourth day the capacity of the rail network as described below restricts the number of unloaded boxcars which can be used to about 105,000 boxcars. This permits the dispatching of 35,000 cars per day. Since our estimate for empty boxcars is 60,000, the origination rate for those cars stabilizes at 20,000 cars per day after the fourth day.

In considering passenger train stock for use in the evacuation of the ill or aged, this study considered using passenger coaches, both self-propelled and non-self-propelled, postal cars, combination mail and baggage cars, and baggage and express (minus "box type") for a total of 5010 units. The figures are shown in Figure C-6. These railway cars might be used with two-day turn-around time.

EVACUEE BOXCARS ORIGINATED

PHILADELPHIA - NEW YORK AREA (3 DAY TURN AROUND TIME)

BORDER: DOVER-HARVE DE GRACE-YORK-LANCASTER-ALLENTOWN-
PORT JERVIS-NEWBURGH-NEW HAVEN

HI-160-RR

Figure C-5

Chapter V
Page C-15

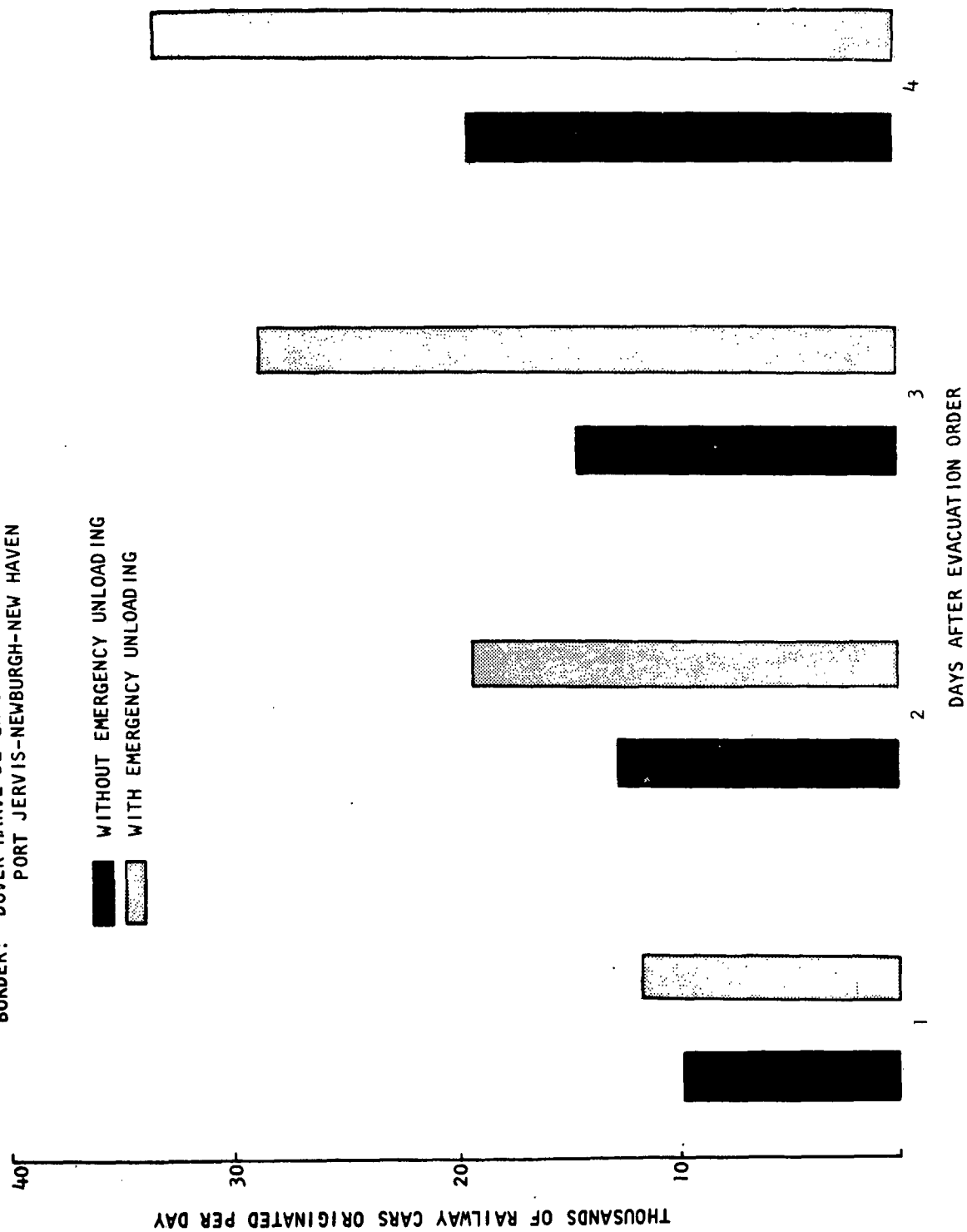


Figure C-6

ROLLING STOCK FOR EVACUATION OF ILL

In Eastern District

<u>Type Car</u>	<u>Total</u>	<u>East of Pa. Line (est)</u>	<u>Pocahontas Region</u>	<u>Total</u>
Passenger Coaches	4,440	3,400*	240	3,640
Postal, Baggage, & Express	2,550	1,200	300	<u>1,500</u>
Total coaches adequate for evacuation of ill				5,140
Estimated number in Baltimore-Boston area				3,000

* Includes an estimated 400 self-propelled coaches available for foreign road service east of the Pennsylvania line.

C.2.2 Make-Up of Evacuee Trains and Hospital Trains

The make-up of the evacuee trains and hospital trains depends somewhat on the amount of money spent on preparations and also on the degree of desperation of the evacuation. Because of siding and motive power limitations our computations have assumed 100 boxcars per evacuee train and about 25 railway cars per hospital train. The degree to which these cars are filled, e.g. whether 65 or 100 to a boxcar, certainly depends in great measure on the haste which seems appropriate. In turn, the number of people per car somewhat effects the preparations which are desirable. Some useful equipment is described below. Supplying this equipment probably corresponds to the preparation of paper plans and modest expenditures as this phrase was used earlier.

In each boxcar, one might want a stove, and stove pipe unit, a sand box, and enough fuel for 48 hours. A medical kit, drinking water unit, and a portable cooling chest to put milk for children, drugs, etc. would also be useful. A doctor and two nurses might be assigned to every twenty boxcars.

The "Hospital" Trains might be made up of 17 passenger coaches and 8 baggage coaches. If possible, they would carry medical equipment for emergency use, including delivery of babies, minor operations, and the like.

C.2.3 Rail Capacity

The "capacity" of the rail network largely depends upon the destinations of the trains. In the evacuations discussed it is generally desirable to send rail evacuees south to Virginia and West Virginia because these areas are relatively safe and difficult to reach by automobile. However, in order to shorten the turn-around time in the most hurried evacuations in which few boxcars are available, one might send all the trains to nearer northern reception areas. The train capacity limitations for various directions which are shown in Figure C-7 were used to determine the rail schedules used later in the one-week and two-day evacuations. The route designations correspond to the indications in Figure C-8.

Figure C-7 (Sheet 1)

DESIGNATION OF RAILROAD EVACUATION ROUTES AND CAPACITY
OUT OF THE NEW YORK CITY-NEW JERSEY-PHILADELPHIA AREA

TO RECEPTION AREAS R-1 (MAINE, R-2 (NEW HAMPSHIRE),
R-3 (VERMONT)

<u>ROUTE</u>	<u>RAILROADS</u>	<u>TRAINS PER DAY</u>
# 1	New York Central Main Line (Interchange with B & M and Rutland)	50
# 2	New York, New Haven & Hartford (Interchange with B & M, Grand Trunk and C.P.)	50
# 3	Erie Main Line - New Haven (Interchange at Maybrook for N.H. Danbury-Pittsfield or Hartford Line)	20
AVERAGE TURN AROUND TIME: 2.5 DAYS		120 TRAINS

TO RECEPTION AREA R-4 (NORTHEASTERN
NEW YORK STATE)

<u>ROUTE</u>	<u>RAILROADS</u>	<u>TRAINS PER DAY</u>
# 4	New York Central West Shore Line (Interchange with D & H)	20
# 5	Erie and/or D.L. & W. Main Line (Interchange with D.L. & W. and N.Y.C., Binghamton, Syracuse- Utica-Watertown-Tupper Lake- Saranac)	20
AVERAGE TURN AROUND TIME: 2 DAYS		40 TRAINS

TO RECEPTION AREAS R-8 (WEST VIRGINIA) AND R-9 (VIRGINIA)

<u>ROUTE</u>	<u>RAILROADS</u>	<u>TRAINS PER DAY</u>
# 6	B & O and Penna. (Interchange with Southern and R.F. & P. at Washington to Richmond-Petersburg- Charlottesville-Lynchburg)	100
# 7	C. N. J. (Interchange with Reading, Cumberland Valley Branch of Penna, B & O, Southern, W.M. and N. & W. to Harrisburg-Hagerstown-Winchester- Strasburg Jct.-Taunton-Waynesboro)	40
# 8	Penna. Main Line, Lancaster-Columbia-York- Keymar-Frederick Point of Rocks Branch (Interchange with B & O main line down Elkins and Charleston branches)	20
# 9	Penna. Main Line B & O (Interchange at Pittsburgh for Parkersburg- Clarksburg-Huntington)	40
AVERAGE TURN AROUND TIME: 3.5 DAYS		200 TRAINS

HOSPITAL TRAINS

<u>ROUTE</u>	<u>RAILROADS</u>	<u>TRAINS PER DAY</u>
# 10	Lehigh Valley RR (Interchange with PRR, Erie and B & O west of Sayre)	36
# 11	Reading (Interchange with PRR-Pottsville- Millersburg)	27
# 12	PRR (Interchange with New York Central)	9
# 13	B & M and New Haven	18
AVERAGE TURN AROUND TIME: 2 DAYS		90 TRAINS

FIG. C-8

1

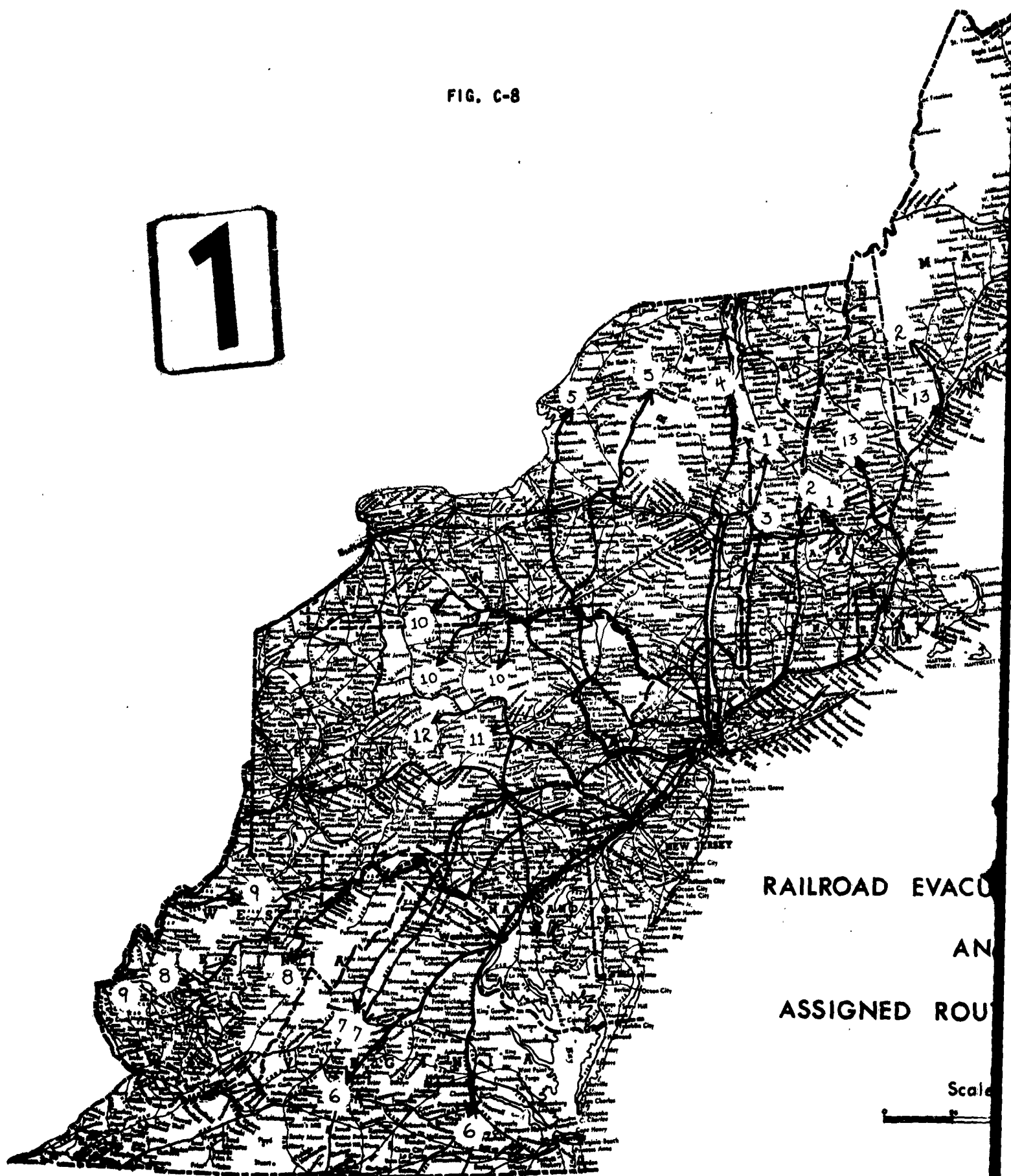
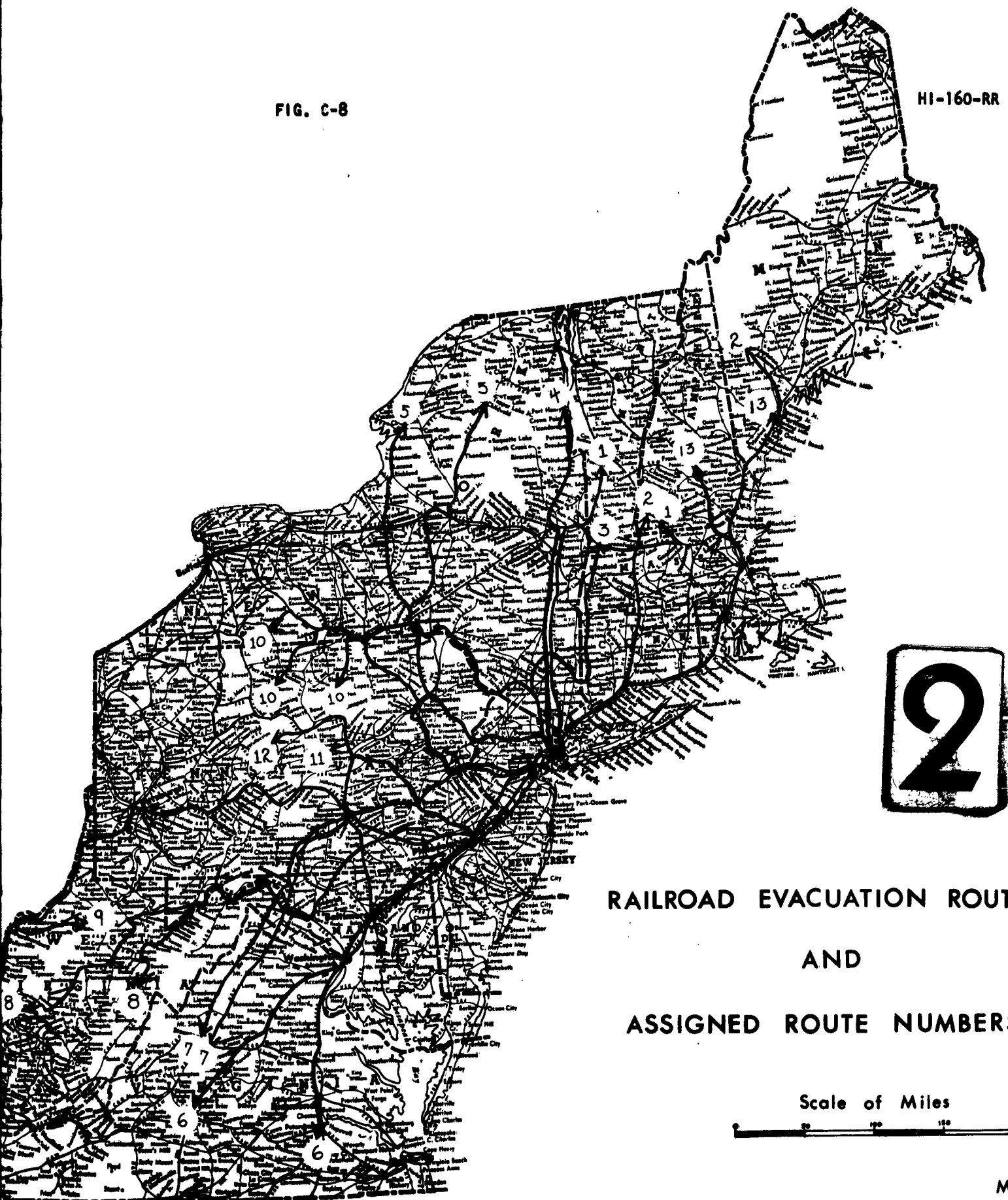


FIG. C-8

HI-160-RR



RAILROAD EVACUATION ROUTES
AND
ASSIGNED ROUTE NUMBERS

Scale of Miles



C.3. Trucks and Busses

In this study we choose to depend primarily on trains and cars for transportation; trucks and busses are not assigned a major role. There are, however, in the region under discussion, about 2,547,000 trucks and 68,000 busses; see Figures C-9 and C-10. With school busses accounting for as many passengers as public busses, the over-all bus capacity is about 4.6 million passengers of which 3.2 million can be seated. This assumes an average capacity of 47 seated plus 20 standees.

Assuming that all motor trucks and trailers and truck tractors in the region under consideration are usable, and each passenger is allotted 10 square feet of space, we would have a total capacity for about 27,000,000 people. If each passenger were allotted only 4 square feet standing space this figure could be raised to 68 million. This assumes that an average semi-trailer, pulled by a truck tractor, contains an inner area of approximately 100 square feet.

However, not all trucks are usable for several reasons. For example, people obviously cannot be carried in specialized trucks such as tank trucks and auto transports. Further study is needed to determine what percentage of all trucks are of this specialized nature. Moreover, not all trucks in the region would be where they could be commandeered at the time of an emergency. This reduces considerably the number available for a two-day evacuation plan. It can be assumed that the total number of trucks which have gone to other regions will be offset by others from outside the region in the normal flow of commerce.

In mountainous terrain, a bus or truck is thought to be equivalent to about eight passenger cars in its effect on traffic flow. Thus in those areas, common in our study, in which mountains are the bottlenecks, the trucks or busses must carry in excess of 32 persons before they begin to be an advantage. In order to carry this number of people, each passenger in an average sized motor truck can be allotted only about 3 square feet of space, while each one in an average sized semi-trailer can be allotted about eight square feet.

Fuel consumption of trucks and busses is high (5 or 6 miles per gallon) but they normally carry very large fuel tanks, accommodating as many as 120 gallons, and therefore require less frequent refueling, as well as less fuel, per passenger mile. Furthermore, the use of trucks and busses can simplify some command and control problems since information and communication for one driver or even for a whole convoy of busses and/or trucks will keep dozens or even hundreds of people in line.

In the one-month evacuation the use of busses and trucks is referred to in the slow evacuation of 1/3 of the population in evacuation areas over a period of two weeks. Their use is not crucial there, since automobiles could be used instead.

Figure C-9

1960 Truck Registrations by State⁽⁴⁾

<u>State</u>	<u>Motor Trucks</u>	<u>Trailers*</u>	<u>Truck-tractors</u>
Conn.	130,152	10,555	5,768
Del.	48,414	6,805	3,486
Me.	72,200	3,966	1,649
Md.	143,030	10,242	8,458
Mass.	191,806	21,504	10,752
N.H.	45,759	2,269	1,166
N.J.	277,000	26,122	13,714
N.Y.	545,432	37,026	28,264
Pa.	548,162	51,689	25,415
R.I.	39,009	5,531	2,187
Vt.	29,390	1,636	1,030
Va.	221,614	25,245	9,071
W. Va.	119,404	7,194	4,007
D.C.	19,655	889	558
Total	2,431,027	210,673	115,525

Total number of motor trucks and truck-tractors: 2,546,552

* Trailers include both full trailers and semi-trailers (which have a larger capacity), but the number of full trailers in the states listed is negligible except in Pennsylvania where there are 1,578.

Figure C-10

1959 Bus Registrations by State (5)

State	School	Commercial	Total
Conn.	1,500	1,177	2,677
Del.	433	193	626
Me.	1,128	352	1,480
Md.	3,229	1,875	5,104
Mass.	1,900	3,058	4,958
N.H.	551	227	778
N.J.	3,055	4,454	7,509
N.Y.	10,432	9,125	19,557
Pa.	7,322	5,913	13,235
R.I.	380	495	875
Vt.	360	99	459
Va.	4,439	2,049	6,488
W. Va.	1,904	631	2,535
D.C.	-----	1,655	1,655
Total	36,633	31,303	67,936

C.4 Barges

A preliminary look at the use of waterways for evacuation was made. The only significant possibilities for the Northeastern United States is the New York State Barge Canal System. Ocean going vessels could carry evacuees. However, there are not facilities for large numbers of vessels to dock and disembark passengers. In any case, Albany and the parts of the canal between Albany and Buffalo (these parts are only 9 to 12 feet deep) are in areas to be evacuated. Hence the evacuees would have to be moved further by some other means.

The only part of the State Barge System which is not in an evacuation area is a forty mile stretch of the Hudson River around Kingston, N.Y. and a shallow part above Albany. It is possible to imagine boats and barges loaded with people sitting in the canal in these areas. However, the former stretch of river is between two large targets; the New York area topped on the north of Newburgh is to the south and the Albany-Troy-Scenectady complex is to the north. Hence, while this area might receive a two-day dose of less than 900 R in the kinds of attacks considered, assuming mean seasonal winds, small and not improbable changes in wind direction would make the area much more hazardous.

Some additional investigation concerning the depth and width of the river is necessary to see whether barges anchored in it would receive a sizable benefit from the water absorption of fallout.

For three or four months of the year the canals are frozen and fog is often a problem. This waterway like most others is paralleled by the New York Central four track main line; so since the railroads are about six times as fast as the barges, and have a much greater all weather capacity, further investigation is expected to show that the waterways will play a minor role if any in evacuation.

C.5 Weather

The success of evacuations will depend more or less on weather conditions. The greatest concern is with the possibility of having to evacuate in winter while snow is on the roads. Extreme weather conditions could stop or greatly delay an evacuation. Rain and very high temperatures could also hamper an evacuation. In this section we discuss various weather problems primarily related to transportation, though this is not the most important weather aspect of evacuation.

Low winter temperatures would tend to cause many more deaths and much more discomfort than high summer temperatures. The length of time a population could stay in shelters would be determined by ability to moderate extreme temperatures. Frozen ground would make it more difficult to improvise shelters as indicated in Section E page 11.

It seems clear that transportation for an evacuation could be hopelessly snarled by a severe snowstorm. Other weather factors seem less obstructive. The major possibilities are discussed below.

A. Prediction

Our present capacity for weather forecasting permits detailed reports for no more than two or three days in advance. Forecasts three to seven days in advance usually are successful in predicting only temperature (as it compares to the normal for that period) and the prospects for precipitation. Day by day forecasts cannot be made for more than one week in advance.⁽⁶⁾ According to the United States Weather Bureau, the accuracy of prediction relative to precipitation in the last two to three years has been 90% for a 12 hour period, 85% for a 12 to 24 hour period, and 75% to 80% for a 24 to 48 hour period. Snow is especially difficult to predict because it depends in part on temperature changes. Snow "may be expected" two days in advance but the amount is usually predicted only after it begins to snow.

B. Snow

There are times from December through March when storms totaling between 3 and 13 inches of snow would occur, in the four major cities of our evacuation region, as shown in the following table.

Average Total Amount of Snow in Inches (7)

	<u>J</u>	<u>F</u>	<u>M</u>	<u>A</u>	<u>M</u>	<u>J</u>	<u>J</u>	<u>A</u>	<u>S</u>	<u>O</u>	<u>N</u>	<u>D</u>
New York	7	9	6	1	T	0	0	0	0	T	1	6
Philadelphia	5	5	4	T	0	0	0	0	0	T	1	4
Boston	13	10	8	1	T	0	0	0	0	T	2	7
Washington	4	4	3	T	0	0	0	0	0	T	1	3

T = trace

A number of precautionary measures can be taken to increase an evacuation capability in winter. All persons responsible for road maintenance such as heads of city, town, county, and state departments of public works should be made aware of which roads to be used in evacuation should be given priority treatment. A "pre-sanding" method used to some extent now, might be recommended for potential evacuation roads. This involves spreading sodium chloride (or its equivalent) on the roads when snow is expected but before it actually starts to fall. Much of an early snowfall on sodium chloride treated roads will melt away. If a snowstorm is in process at the time of evacuation, three lanes can be cleared by having three trucks equipped with push plows and wing plows, working in tandem, on 10 mile lanes. A survey should be undertaken to determine the amount and type of snow removal equipment available in the areas near automobile evacuation routes. Paper plans might include the possibility of reassigning equipment from one department of public works to another in time of crisis.

Expensive winter preparations could include stocking the re-fueling stations with certain kinds of supplies. These stations in addition to providing usual supplies for motorists, could stock sodium chloride, sand, shovels, chemical de-icer, anti-freeze, windshield wipers and so on.

C. Rain

Flooding caused by heavy rainfall must be recognized as a possible evacuation hazard. Potential major flood areas all over the country are recognized as such, charted, and observed. Our concern is not merely with those areas but also with the relatively minor type of flood inundating roads. Limited danger from flooding can be seen during any heavy rain in Westchester County, New York,

particularly on the Hutchinson River and the Saw Mill River Parkways. According to rainfall statistics available from the Woodlands Park at Ardsley, New York, it seems unlikely that evacuation traffic would be halted or even detoured from these parkways because of flooded roads. Between January, 1958 and May, 1962 there were only five days when flooding was reported on both the Hutchinson River Parkway and the Saw Mill River Parkway, and on only one day was it considered necessary to set up detours. These detours lasted from 15 to 45 minutes. Rainfall recorded for that particular day, between midnight and noon, was 1.19 inches, with the rain falling at the greatest rate (.34 inches) between 3 a.m. and 4 a.m. This is far from a record amount of rainfall (recorded) for a day, and certainly not an unusually high rate of fall at its peak. However, it is important to realize that there are other factors than rainfall rate contributing to a flood situation. The fact that the day before a total of 1.21 inches of rain had fallen in 19 hours helps explain why the detours became necessary. (8)

During winter months, the fact that the ground is frozen and therefore does not absorb moisture adds to the danger of flood conditions. Again, sudden warm weather in early spring (or even in winter) could melt whatever snow had been piled along the roadside. That, coupled with some rain, might well cause flash flooding. Hard rains (often localized) of short duration flowing into leaf-clogged catch basins can cause flooding. These situations are unpredictable although certain trouble spots are recognizable and unavoidable. Paper plans could designate such points and mark possible detours. It is possible that minor flood conditions which normally would not call for a detour would require a detour for evacuation traffic. Even if cars are able to pass through flood waters of 1 or 2 feet, they will perhaps stall and may suffer temporary loss of brake power. In traffic as heavy as that in an evacuation situation a number of minor accidents could occur. Pre-evacuation instruction of motorists could include facts about drying out brakes and similar instructions.

APPENDICES TO SECTION CAppendix C-1Description of Automobile Evacuation Routes

<u>Route</u>	<u>Lanes</u>	<u>Description</u>
Rte. 1	2	US Hwy. 1 from Danvers
Rte. 2	4	Interstate Hwy. 95 from Danvers
Rte. 3	2	US Rte. 3 from Lowell to Concord, then State Rte. 28
Rte. 4	2	State Rte. 12 to Leominster; State Rte. 12 to Milford; then Interstate Rte. 93
Rte. 5	2	US Rte. 5 from Hartford
Rte. 6	2	US Rte. 7 from Pittsfield
Rte. 7	2	US Rte. 9 from New York City
Rte. 8	2	State Rte. 5 from Schenectady to Amsterdam; then State Rte. 30
Rte. 9	2	State Rte. 12 from Utica to Lowville; State Rte. 26 from Lowville to Fargo; then State Rte. 3
Rte. 10	2	US Rte. 11 from Syracuse
Rte. 11	2	US Rte. 9 from New York City
Rte. 12	4	Interstate 87 from New York City
Rte. 13	2	State Rte. 23 from Paterson, N.J. to Port Jervis; State Rte. 97 from Port Jervis to Hancock, N.Y.; State Rte. 17 from Hancock to Binghamton; then US Rte. 11 N
Rte. 14	2	US Rte. 6 from Milford, Pa. to Carbondale; US Rte. 106 to Kingsley; US Rte. 11 N to Binghamton, N.Y.; State Rte. 17 from Binghamton, to Waverly, N.Y.; US Rte. 220 S

<u>Route</u>	<u>Lanes</u>	<u>Description</u>
Rte. 15	2	US Rte. 411 from Stroudsburg, Pa. to Scranton; US Rte. 6 from Scranton
Rte. 16	2	State Rte. 115 from Easton, Pa. to Williamsport; then US Rte. 15 N
Rte. 17	2	US Rte. 22 from Easton to Fogelsby, Pa.; US Rte. 309 N to Hometown to Shamokin Dam; US Rte. 15 N to Williamsport; State Rte. 220 W to Lock Haven; then US Rte. 120 N
Rte. 18	2	Interstate Rte. 80 SW from Philadelphia to Steelton; then US Rte. 22-322 N
Rte. 19	2	US Rte. 15 from E. Avon
Rte. 20	2	State Rte. 63 from Pavilion to Dansville; then State Rte. 36
Rte. 21	2	State Rte. 16 from Buffalo
Rte. 22	2	State Rte. 62 from Buffalo to Hamburg; then State Rte. 219
Rte. 23	2	US Rte. 6 from Mill Village
Rte. 24	2	US Rte. 322 from Meadville
Rte. 25	2	Interstate Rte. 70 from Washington (Pa.) to Wheeling, W. Va.; State Rte. 2 from Wheeling to St. Mary's, W. Va; then State Rte. 16
Rte. 26	2	US Rte. 19
Rte. 27	2	US Rte. 40 from Washington, (Pa.) to Uniontown; then State Rte. 119
Rte. 28	2	State Rte. 51 from Pittsburgh to Uniontown; US Rte. 40 from Uniontown to Keyzers Ridge; then US Rte. 219
Rte. 29	2	US Rte. 220 from Bedford
Rte. 30	2	US Rte. 11 from Carlisle

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Chapter V
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<u>Route</u>	<u>Lanes</u>	<u>Description</u>
Rte. 31	2	State Rte. 40 from Baltimore to Frederick; then US 340 S
Rte. 32	2	US Rte. 29-211 from Washington, D. C.
Rte. 33	4	US Rte. 1 from Washington, D. C.
Rte. 34	2	US Rte. 50 from Queenstown, Md. to Davidson- ville; US 301 S

Appendix C-2

Railway Operations

Classification Yards

Under phase one, all classification yards in the northeast region will be used to make up trains of empty boxcars, working from both ends if necessary. All loaded box cars and all other cars will be stored out of the yards when these cars occupy relay and classification tracks. These cars will be stored at nearby storage and terminal yards or on the main line of non-evacuation routes, particularly on one track of double track routes. All trains of empty boxcars will be forwarded to evacuee loading areas as soon as they are made up.

Two directional class yards will classify in the manner described above in both yards with the reverse movement from one yard handled by yard engines if necessary. These engines could also pump up the air, etc. if these tracks are not piped so that when the road engine cuts in the train could be dispatched in the opposite direction without delay.

Relay sections of class yards should be kept open.

Under phase two, trains of loaded boxcars will also be made up in class yards in the manner described above. These trains will then be moved to a storage area or stretch of right-of-way where their contents can be off-loaded. When empty, these trains will be dispatched to evacuee loading areas.

Storage and Terminal Yards

These yards will be used primarily to contain cars not involved in the movement, i.e. hoppers, gons, tank cars, cattle cars, etc. Local yard engines will shift for boxcars at these sites when convenient, and empty trains may originate here. Non-essential cars from the nearest classification function will be stored here. In evacuee train originating and terminating areas these yards would function as terminals.

Motive Power

All evacuee trains will have two-or-three-unit diesel locomotives assigned to them, preferable general purpose locomotives, except for areas of electrification where motors with at least

4,000 horsepower aggregate will be assigned. All "hospital" trains will have the same motive power assignment except when one electric motor will not provide enough steam to heat the trains. Then a second unit will be used.

Motive power units will be run over foreign roads where necessary on a planned schedule for service and movement. Where possible, units will remain with the train to destination and return, changing crews where necessary. Helper units will be used where necessary but the use of multi-unit diesels for there relatively light trains should reduce this problem except on the steepest grades.

Loading and Unloading Areas

Trains are assumed to spend from 6 to 12 hours getting into and out of the loading and unloading areas. Motive power coming in with trains of empties will cut off and pick up trains already loaded as soon as the engines are serviced. Empties will be stored and moved into loading positions by yard engines when necessary.

If unloading areas use extensive yard facilities the same process will be used; if not, the engines will stay with the train.

Passenger Terminals

Hospital trains and local shuttle trains to outlying freight terminals would originate at passenger terminals in evacuation areas. In reception areas these facilities would be used to terminate hospital and evacuee trains.

Road Movement

All evacuee trains (empty or loaded) will operate as solid "relay" trains and move under the highest priority orders. They will also be "over powered" for rapid acceleration. The turn-around figures for cars was kept modest, however, because of the unaccustomed volume of movement on small branch lines and the danger of "cueing" when yarding trains at small yards.

FOOTNOTES TO SECTION C

1. A Preliminary Report on Highway Needs for Civil Defense, (Washington: U. S. Government Printing Office, October, 1956), Appendix A-1, p. 44.
2. Automobile Manufacturers Association, Automobile Facts and Figures, (Detroit: Automobile Manufacturers Association, 1961), p. 22-23.
3. Turn around time refers to the time expended from the loading of a car, through the loaded movement, delivery, unloading and empty movement to the point of reloading.
4. Automobile Manufacturers Association, Motor Truck Facts, (Detroit: Automobile Manufacturers Association, 1961), p. 16 and 20.
5. Automobile Manufacturers Association, Automobile Facts and Figures, p. 27.
6. "statement on weather forecasting," Bulletin of the American Meteorological Society, v. 38, no. 7 September, 1957, p. 406.
7. Airport data for period of record through 1960 except New York City figure which is from Department of Commerce Weather Bureau records.
8. Climatological Data of New York, Weather Bureau, U.S. Department of Commerce, Woodlands Park at Ardsley gauge.

Section D. Alternative PlansIntroduction

While evacuation of metropolitan areas is feasible--given sufficient time and money--this examination of alternative plans focuses on magnitudes of time involved in large strategic evacuations and the complexities involved in planning evacuations for different contingencies. It offers examples that are illustrative rather than recommendations. They represent a combination of reality and model. A discussion of contingency planning follows the examples in order to point up some principles in their design.

Three different evacuation plans are set forth: (1) a two-day plan, (2) a one-week plan, and (3) a one-month plan. Some of their interrelations are considered. The two-day plan assumes an attack is imminent and the aim is to evacuate the central cities of New York and Philadelphia and some other areas by auto and rail into safer reception areas while the population of large areas potentially threatened by fallout try to improvise suitable protection. In effect, the people of most seriously threatened areas would be given priority on the roads and rail. The one-week plan assumes that at least a few days are available to try to complete the evacuation of all metropolitan areas and those where there is presumed to be a high probability of serious fallout. Since the timing of an attack cannot be predicted, we build upon the two-day plan when more time seems to be available to show what can be done in one week. This might be called a two-day extended evacuation. Accordingly, a less effective redistribution of population would occur at the end of a week than if we started with a one-week plan. In discussing a one-month evacuation, we imagine that preparations are stretched out over a longer period of time during an escalating crisis so that the economy is not as disrupted as in the shorter plans and the non-essential population may leave in a more "leisurely" way to be followed, if necessary, by the remaining populace on an accelerated schedule. Meanwhile, a sizable percentage of the population in expected high fallout (but not blast) areas is expected to be building fallout shelters rather than moving to overcrowded reception areas.

All three plans raise questions which should be answered in other more detailed studies.

D.1 One-Week Plan

In the one-week plan we imagine a situation in which a thermonuclear attack is likely within a few days or possibly a week. It assumes that there is not sufficient urgency to call for improvised desperation methods; but there is a reasonable probability that an evacuation can be completed. A conventional attack on Europe which

seems to be quickly escalating to our disadvantage, or in which nuclear weapons may suddenly be introduced, might create this situation. Whether time seems available for a seven-day evacuation will depend on how the threats and counterthreats being employed by both sides and the rate of escalation are evaluated. The initiation of this plan would be based upon a judgment that it would have a reasonable chance of being completed. If time seemed shorter than expected, improvised protection could be used by a speed up, switching from the one-week plan to the two-day plan.

Figure D-1 describes the evacuation and reception areas. (They are listed and numbered in Appendix D-1.) The density per square mile and the proportion of evacuees to resident population in the reception areas are shown in Figure D-3 and compared with the two-day extended evacuation in Figure D-10. In interpreting these figures, and others of a similar kind, it must be remembered that a uniform distribution of evacuees per house could be arranged only with great difficulty, and that if it were, the density of the new population per square mile would show the same unevenness revealed by the existing pattern of population distribution. Thus these figures are abstract indications of the situation, which in theory are incompatible and in practice probably impossible to achieve.

By using the evacuation route map, Figure C-2, Figure D-2 on the use of evacuation routes, and the one-week evacuation areas table, Figure D-4, it is possible to determine the number of evacuees which this plan could move from evacuation areas and the direction in which they would be moved. The density before and after evacuation of the evacuation areas is also shown for a 90 per cent evacuation in Figure D-4. By using the "Evacuation Routes" table in Appendix C-1 which describes and designates the routes, it is possible to compute the number of lanes appropriate to the areas. Using 100,000 people per lane per day along these routes (as the expected flow) allows the reader to estimate the time required for evacuation by car under all these assumptions. A discussion follows.

In evacuation area E-11 which contains New York City, Philadelphia, and the state of New Jersey, there are more than 21 million people. Since this area presents the greatest difficulties for any evacuation, it is discussed first. Driving from this area into Virginia requires crossing the Susquehanna and Potomac rivers. In order to penetrate sufficiently far into Virginia to disperse into homes and remembering that Fairfax County is an evacuation area itself, Philadelphia residents must drive about 250 miles. New York City residents require about 100 miles more. In addition, the bridges across the Potomac are required to transport Baltimore and Washington residents and would probably be tied up for a week with this load alone. Thus this plan does not call for driving into Virginia from E-11.

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Figure D-1

1

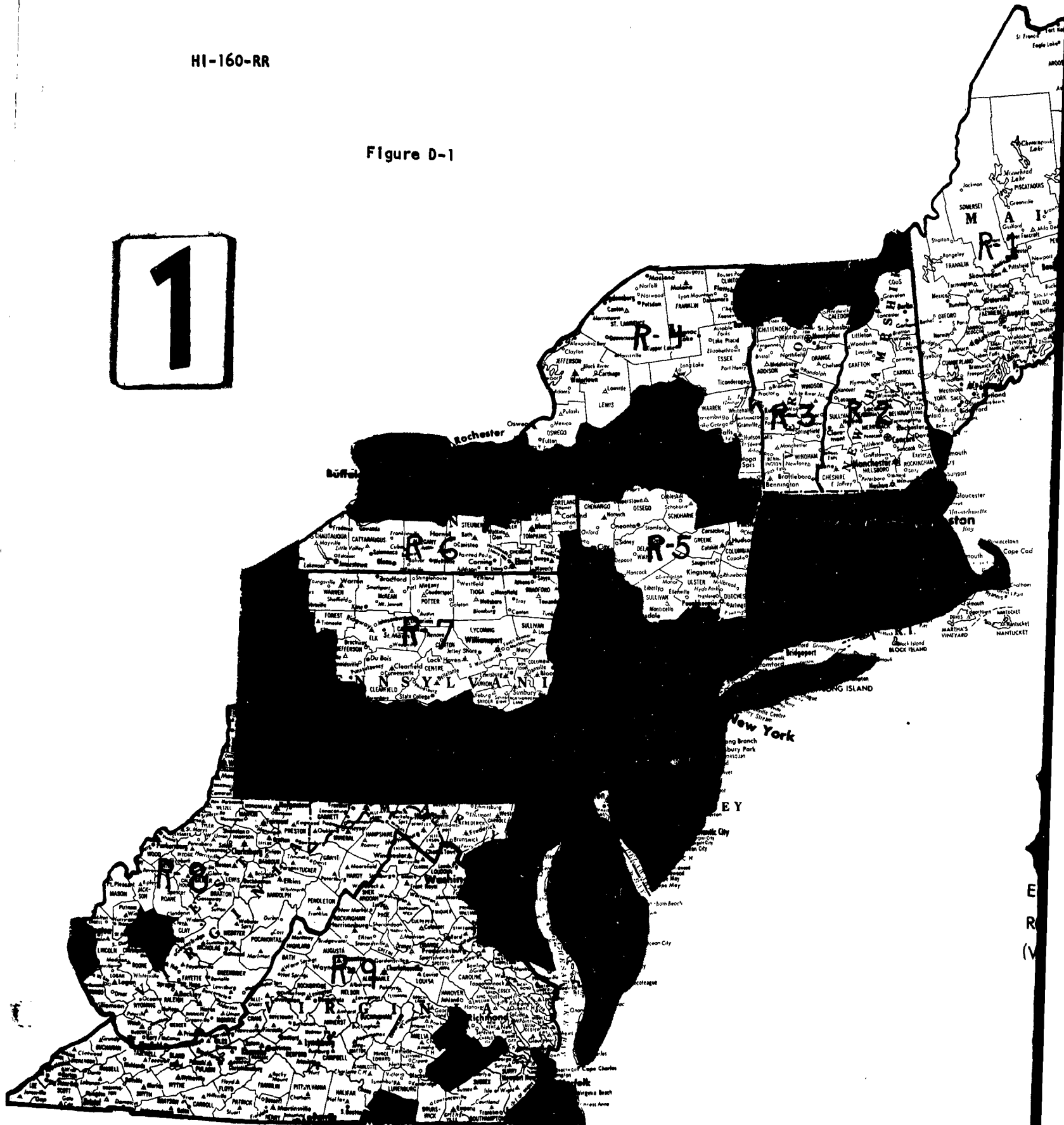


Figure D-1

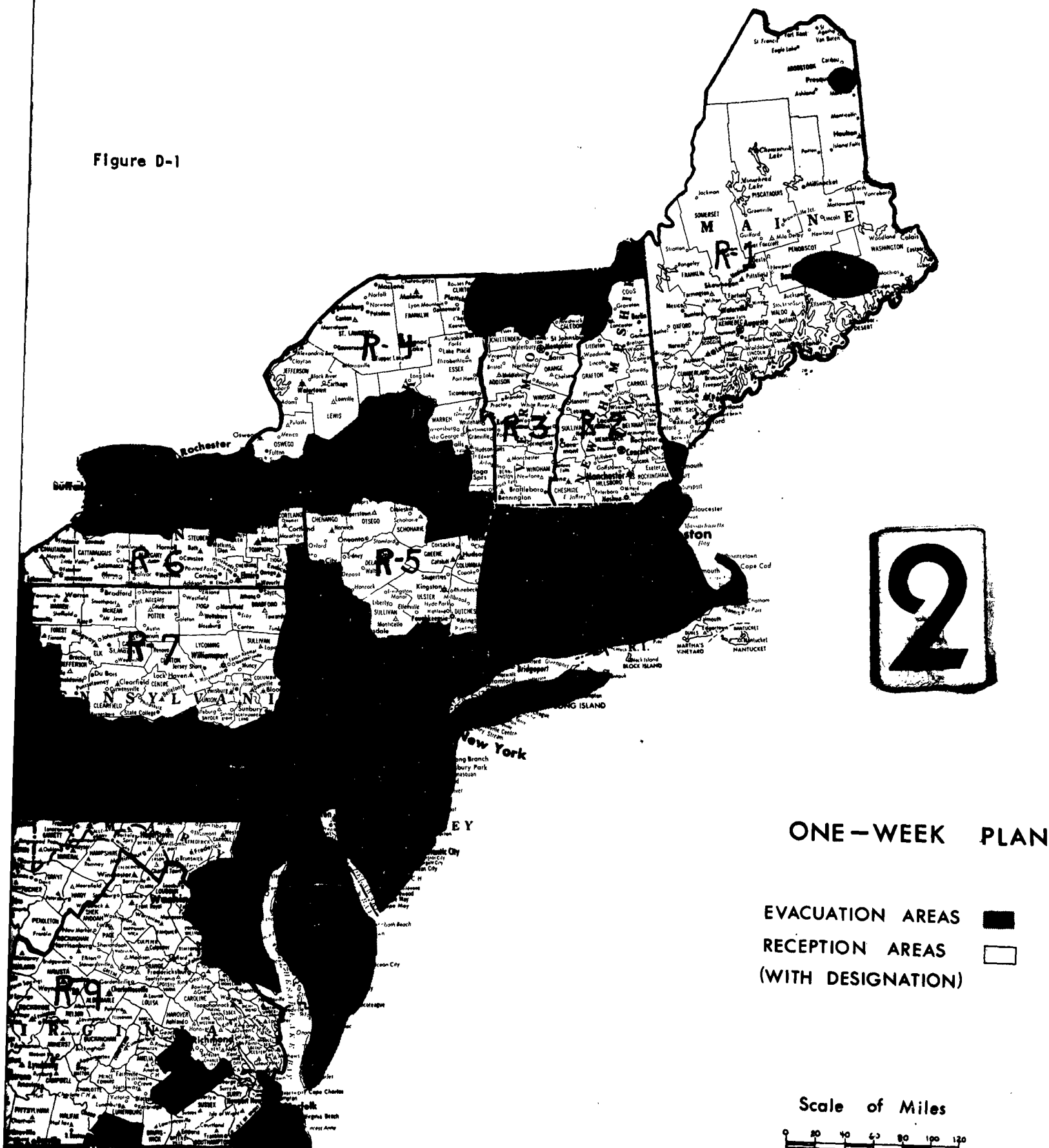


Figure D-2

USE OF EVACUATION ROUTES IN ONE-WEEK EVACUATION

<u>AREA</u>	<u>ROUTES USED</u>
E-1 MASS.-CONN.-RHODE ISLAND	1,2,3,4,5,6
E-2 PORTSMOUTH-NEW HAMPSHIRE	LOCAL ROUTES
E-3 BANGOR	LOCAL ROUTES
E-4 PRESQUE ISLE	LOCAL ROUTES
E-5 PLATTSBURGH	LOCAL ROUTES
E-6 SYRACUSE-ALBANY	8,9,10
E-7 BUFFALO-ROCHESTER	19,20,21,22
E-8 ERIE-SHARON (PENNA.)	23,24
E-9 PITTSBURGH-ALTOONA-YORK	25,26,27,28,29,30
E-10 SCRANTON-HARRISBURG (PENNA.)	13,14,15,16,17,18
E-11 NEW YORK-PHILADELPHIA-NEW JERSEY	7,11,12,13,14,15,16,17,18
E-12 BALTIMORE-WASHINGTON	31,32,33,34
E-13 DELAWARE-MARYLAND PENINSULA	31,32,33,34
E-14 NORFOLK (VIRGINIA)	LOCAL ROUTES
E-15 RICHMOND (VIRGINIA)	LOCAL ROUTES
E-16 MECKLENBURGH (VIRGINIA)	LOCAL ROUTES
E-17 CHARLESTON (WEST VIRGINIA)	LOCAL ROUTES
E-18 HUNTINGTON (WEST VIRGINIA)	LOCAL ROUTES
E-19 BINGHAMPTON (NEW YORK)	LOCAL ROUTES

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Figure D-3

1

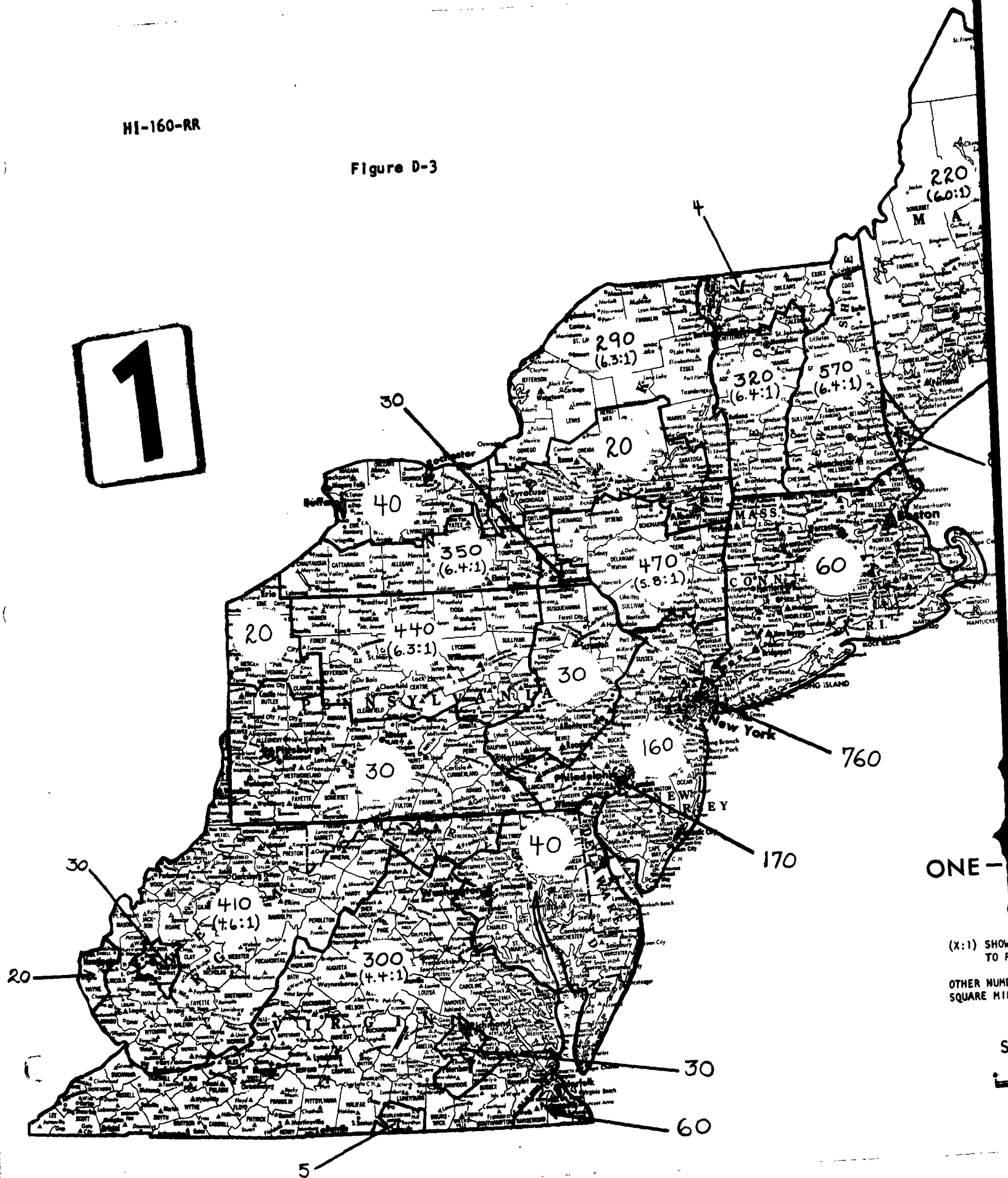


Figure D-3

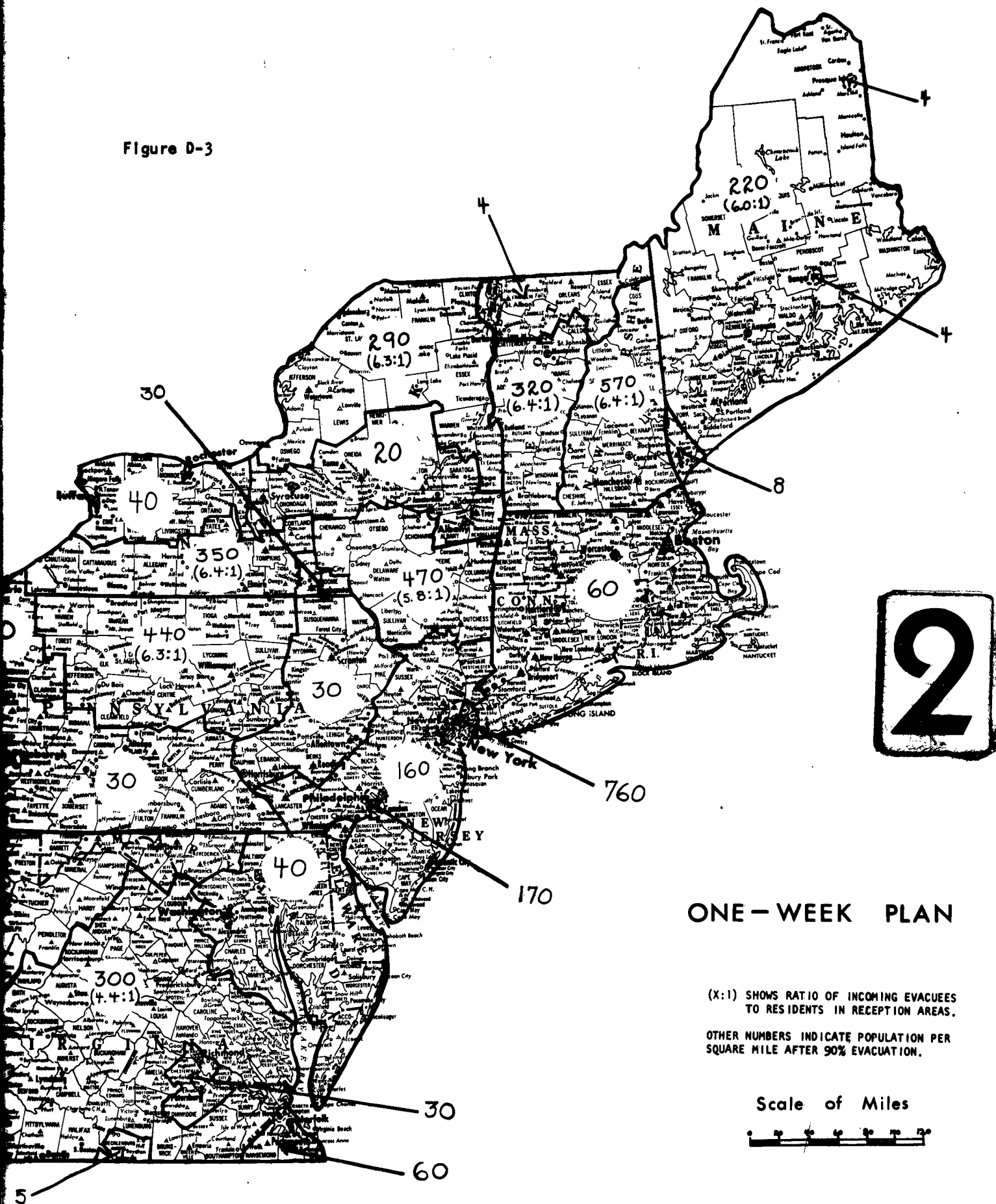


Figure D-4
ONE-WEEK EVACUATION AREAS

<u>EVACUATION AREA</u>	<u>POPULATION BEFORE EVAC. (Millions)</u>	<u>PEOPLE PER SQ. MILE</u>	
		<u>BEFORE EVAC.</u>	<u>AFTER EVAC.</u>
E-1 MASS.-CONN.-R.I.	7.89	600	60
E-2 PORTSMOUTH-N.H.	.05	80	8
E-3 BANGOR	.05	40	4
E-4 PRESQUE ISLE	.04	40	4
E-5 PLATTSBURGH	.23	40	4
E-6 SYRACUSE-ALBANY	1.62	180	20
E-7 BUFFALO-ROCHESTER	2.23	350	40
E-8 ERIE-SHARON (PA.)	.57	150	20
E-9 PITTSBURGH-ALTOONA-YORK	4.28	260	30
E-10 SCRANTON-HARRISBURG (PA.)	2.23	250	30
E-11 N.Y.-PHILADELPHIA-N.J.	21.19	1564	160
E-12 BALTIMORE-WASHINGTON	3.90	80	8
E-13 DELAWARE-MD. PENINSULA	.70	120	10
E-14 NORFOLK (VA.)	.85	640	60
E-15 RICHMOND (VA.)	.52	340	30
E-16 MECKLENBURG (VA.)	.03	50	5
E-17 CHARLESTON (W. VA.)	.25	280	30
E-18 HUNTINGTON (W. VA.)	.15	200	20
E-19 BINGHAMPTON (N.Y.)	.21	300	30

In the one-week plan the residents of Massachusetts, Connecticut, and Rhode Island are also evacuated and they tend to fill the roads into Vermont, New Hampshire, and Maine, Routes 1-6. Even when certain roads into Vermont and New Hampshire become available, heavy use of these roads would greatly distort the final distribution of population in the different reception areas; i.e., Vermont has more road capacity into it than is necessary to absorb evacuees even at 7 to 1 or higher. There are arguments to be made for using this road capacity anyway and allowing the distortion of population. Whether or not one wants to do this depends on the time available. In the two-day extended plan, results of such a policy appear.

Another option available to the residents of E-11 is to drive north on routes 7, 11, and 12, as shown in Figure D-2. In the one-week plan 6 lanes are used to drive the relatively short distance to reception area R-5 in the Catskills. Route 11, with 2 lanes, is used to drive into the Adirondacks (R-4), a considerably longer distance of about 250 miles.

Still another possibility is to drive into northern Pennsylvania (R-7) or to southwestern New York (R-6). The latter possibility is for the most part discarded because of the distances required and the necessity of using this area for Buffalo and Rochester area residents. In driving to northern Pennsylvania, six roads are used. These routes begin to merge significantly some distance within the reception area, but since dispersal will occur within the borders of the area, this drawback has been ignored. The routes shown start from the Susquehanna since there seems no difficulty in finding the road capacity to keep them filled on the east side of the river. It seems very difficult, however, to find more evacuation routes into this area from (E-11). The roads pass through the Appalachians, and gaps with roads through them are few. Our routes start at Paterson, N.J., Milford, Pa., Stroudsburg, Pa., Easton, Pa., and Philadelphia. A final possibility for evacuation by automobile is to have evacuees drive west, along the Pennsylvania turnpike, for example, and then into West Virginia. Since this route is long and adds to the substantial population of (E-9) Pittsburgh-Altoona-York which is driving in the same direction, it has not been used. Residents of (E-11) follow this route, but by train instead of car.

It is clear from the geography and the fallout maps associated with the type of attack considered that the evacuations should tend to send people south, where possible. For this reason people in E-9 would be instructed to drive into West Virginia, R-8, on routes 25-30. This area would be relatively less dense in the ratio of evacuees to residents at 5.7:1 than other areas. The density per square mile would be about 390 if a uniform distribution could be achieved.

The one-week plan has people from E-12 and E-13 (Delaware-Maryland Peninsula) using routes 31-34. These areas together have about

4.6 million people and at 100,000 people per lane per day these eight lanes would require about five days to remove 90 per cent of the population.

The Erie-Sharon area uses routes 23 and 24 and requires approximately a day to evacuate at the assumed rate.

Figure C-5 shows the accumulation of empty freight cars in two examples. In the first case, boxcars would be emptied with a loss of their contents and in the second they would simply be stalled and ignored. At 100 boxcars to a train, the number of trains which could be made up rises from about 100 the first day to 350 in a few days if contents are jettisoned. The rail limitations among different routes are shown in Figure C-7. Considering the shortage of boxcars, the schedule in Figure D-5 could only be maintained if boxcars should be unloaded.

The routes involved are shown in Figure C-8. The train indicates that preference should be given to sending evacuees to the Virginias during the first two days when a shortage of boxcars would keep the number of trains to 100 the first day and 200 the second. After the first two days there would be sufficient boxcars to send another 100 and later even 150 more trains in that direction, but the rail capacity noted in Figure C-7 would prevent this. If this were not the case, attempts to send more evacuees south would tend to make this desirable although the turn around time involved is about three days. A shorter turn around time of two days is available to the northern reception areas and this tends to make it desirable to overcrowd those areas in favor of being able to speed up the evacuation. The one-week plan does not weigh time this heavily, but the two-day plan does as is noted in the next section. The other train schedules are also determined first by number of boxcars available and then when more empty cars have arrived, by the capacity of the rail network. Shortages of locomotives have played no role and the cars are very lightly loaded by railroad standards.

The railroad map, Figure C-8, indicates the fine net of railroad lines which the northeast area possesses. This capacity to distribute people very near even small towns underlies their use. This study assumes that the evacuees can be delivered nearly enough to their reception point to be shuttled to individual homes by the cars and buses in the area.

In Figure D-6, the rate of arrival at reception areas of people from E-11 by train is compared with the evacuation by car. The inflection point in the train curve is a result of the fact that more and more boxcars become available during the first few days. The curve rises more slowly toward the end as the supply of evacuees drops off. The curve assumes that all boxcars are unloaded in an

Figure D-5

TRAIN SCHEDULE USED IN ONE-WEEK PLAN
FOR
EVACUATION OF E-11 (NEW YORK-PHILADELPHIA-NEW JERSEY AREA)

INTO R-8 (W.VA.) & R-9 (VA.)

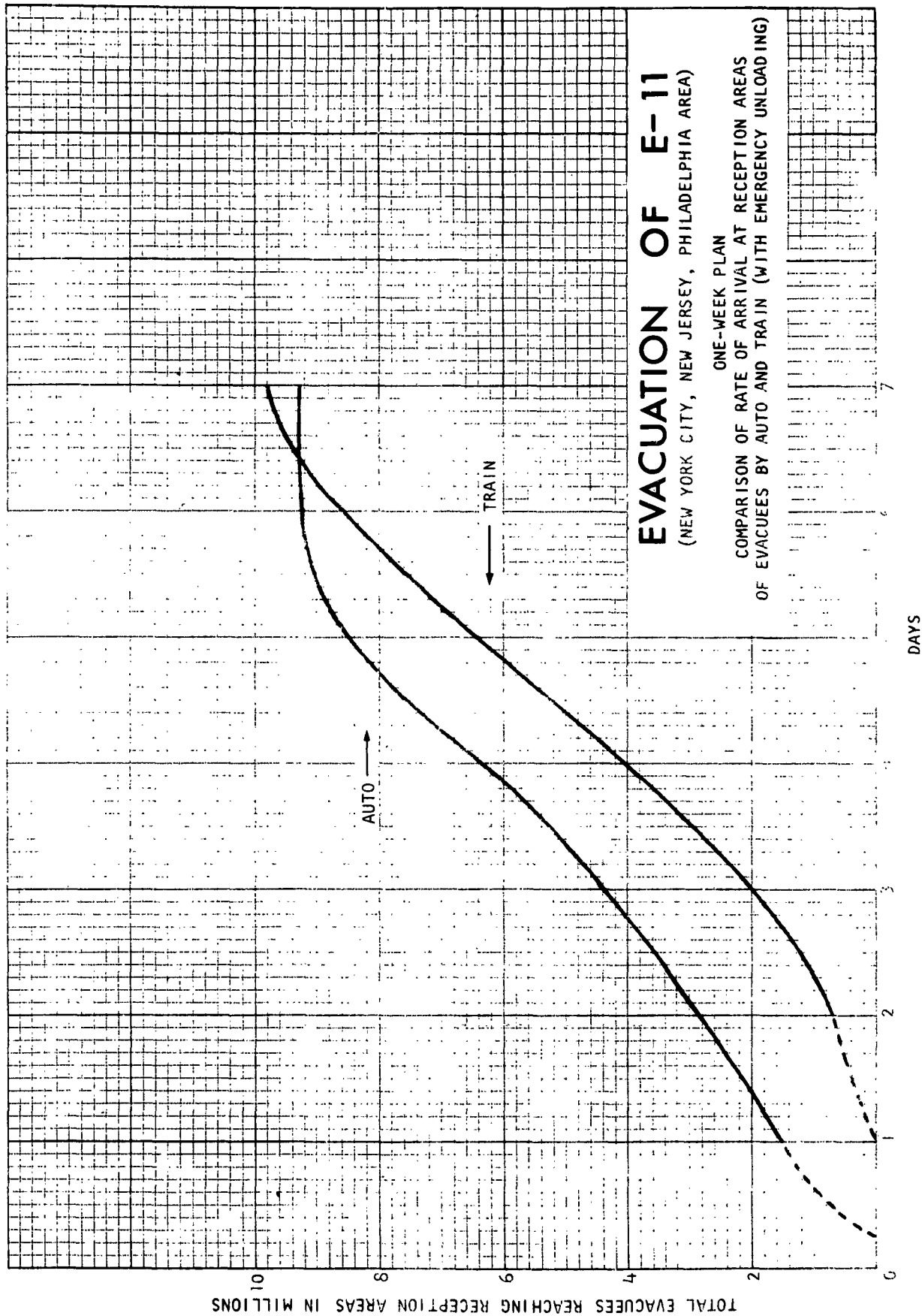
<u>SENT ON</u>	<u>TRAINS</u>
Day 1	100
Day 2	200
Day 3	200
Day 4	200
Day 5	200
Day 6	85

INTO R-4 (N.E. NEW YORK)

<u>SENT ON</u>	<u>TRAINS</u>
Day 1	0
Day 2	0
Day 3	40
Day 4	40
Day 5	40
Day 6	35

INTO R-1 (MAINE), R-2 (N.H.) & R-3 (VERMONT)

<u>SENT ON</u>	<u>TRAINS</u>
Day 1	0
Day 2	0
Day 3	60
Day 4	110
Day 5	110
Day 6	95



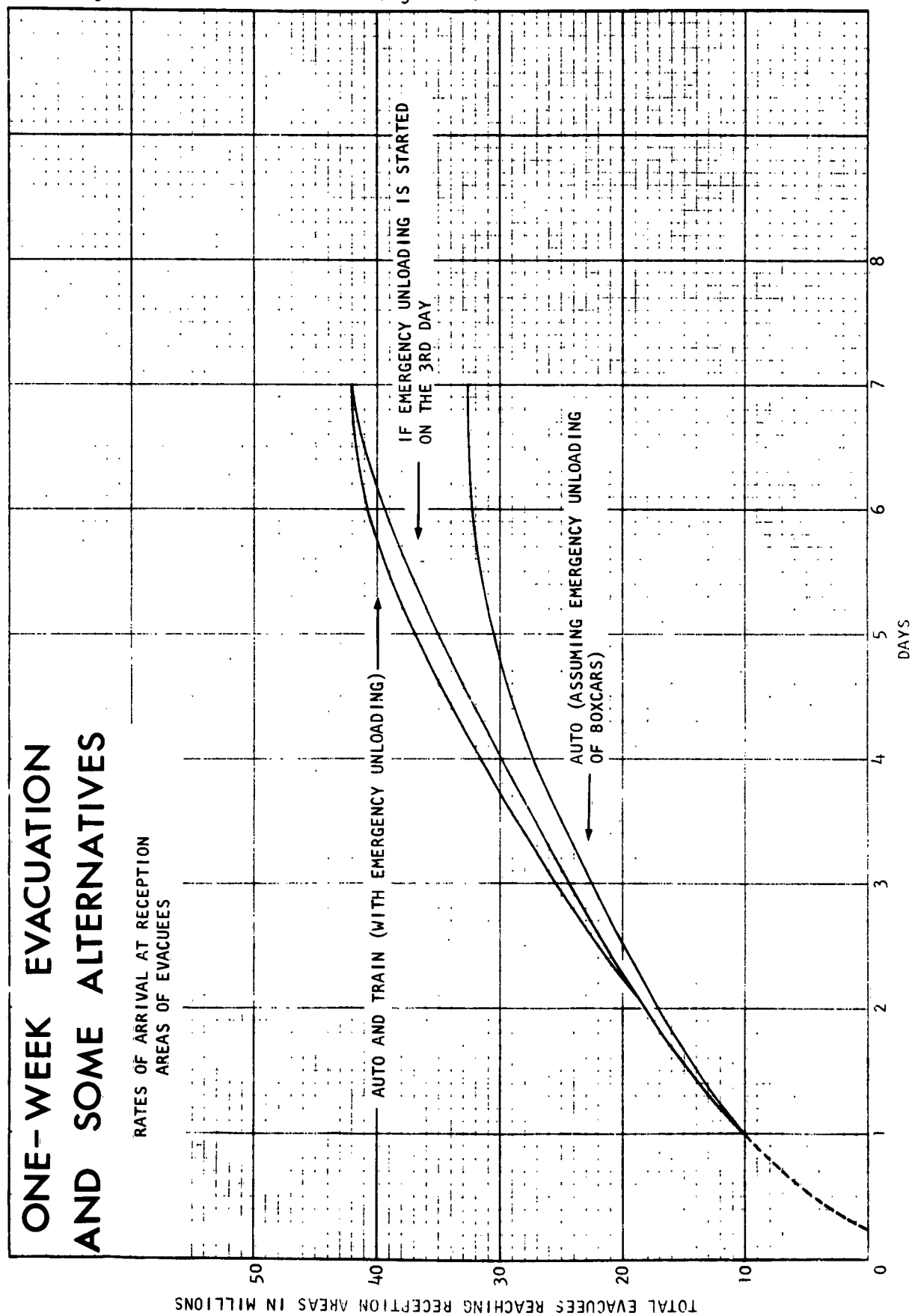
emergency fashion to be made available for the evacuation. The inflection point in the car graph reflects the use of roads by the E-11 Area which were used by other areas earlier.

In Figure D-7, the cumulative rate of arrival at reception areas for the entire one-week evacuation is shown in various ways. The rates by auto, and by auto plus train, are shown for both emergency unloading of boxcars and no unloading. The emergency unloading case involves jettisoning the contents of boxcars in order to use them for evacuee movements. In the other case they are simply yarded and only the empty ones are used. The curve which shows the rate without resorting to emergency unloading stops at the sixth day. In order to continue it one must specify the rate at which evacuation by automobile would continue. The evacuation by automobile curve is drawn on the assumption that emergency unloading would have occurred. In particular, it does not increase significantly after six days. If only empty boxcars had been assumed, it would continue to increase until the combined number of evacuees using "empty" boxcars and cars totaled 42 million. This would take about eight days instead of seven.

If on the third day one should begin to jettison the contents of boxcars and to use them for evacuation, the evacuation is shown as completed in seven days, but the hedging has slowed down the rate of evacuation. For example, at the end of four days, two million fewer people would have reached the evacuation area. All curves typically slow their rate of increase as many smaller areas become emptied after a few days and the rate reaching the reception area by auto declines.

The one-week evacuation results in the distribution shown in Figure D-3. This evacuation has been designed with the possibility of both a counterforce and countervalue attack in mind. It has been assumed implicitly that an attack would not be retargeted to strike evacuated people. Attempts to protect against an attack which uses knowledge of the reception areas and aims at people would be difficult to say the least. As a first approximation, it would seem in such situations that one would try to spread the population over as wide an area as possible in a uniform manner which would minimize the population density. Carried to an extreme, this would require a distribution allocating only 50 persons per square mile over the United States as a whole. The population east of the Mississippi represents about 130 persons per square mile if distributed in that area. In the Northeast area, which we have restricted ourselves to, this approach would result in about 230 persons per square mile. This distribution would not, however, by any means, equalize the risks among the population. Faced with such a distribution, an adversary would undoubtedly prefer to attack industrial areas and cities if he intended as much destruction as possible. A more reasonable plan would therefore probably try to spread the population over non-industrial areas to a considerably greater degree than industrial ones. (By industrial areas is

Figure D-7



meant the heavy fallout areas which result from attacks on cities as well as the cities themselves.) Figure D-3 shows that the one-week plan is not unreasonable as an attempt to weigh these two effects. The density in the reception areas varies from around 230, the rate of completely uniform distribution, to 500 or 600. Meanwhile, the 10 per cent left in the evacuation areas represents a small bonus target in addition to the empty cities. The crucial assumption which underlies the argument that this evacuation is a reasonable reply to threats to attack the population is the assumption that the population will stay within the Northeast area. Other plans can be imagined if time permits and if the railroads are used heavily along with automobile evacuation routes. If feasible, these plans would probably be much superior. These plans might involve dispersion to Canada, long train rides west or south, some movement by ship, or a sequence of evacuations and re-evacuations to successively less threatened areas as long as time permits.

D.2 Two-Day Evacuation

In this evacuation we imagine a crisis so intense that war is considered imminent. In a tense situation, a Soviet evacuation secretly carried out and suddenly disclosed with an ultimatum might produce such a crisis. The sudden introduction of thermonuclear weapons in a European war or their use against major population centers of either the U.S. or one of our allies might be another example. The situation might be precipitated by threats of our own to attack within a certain short period if demands were not satisfied or if certain European military positions were attacked.

The computations in this section are conservative in one regard. Although the situation envisaged is desperate, the assumption concerning people per automobile and per railway car have been made just as in the one-week case. Further overcrowding might well be appropriate so that the estimated rate of movements to reception areas could be somewhat higher.

If one continues to imagine the sort of attack to which the one-week evacuation would be related, it would not be possible to move most of the population from evacuation areas in a matter of two days. In such a situation, the controlling fact is that the major metropolitan areas are the most vulnerable in any large attacks. Figure D-9 shows the anticipated use of the evacuation routes. In the New York-New Jersey-Philadelphia area the roads leading to reception areas and immediately available rail capacity are very limited in relation to rapid evacuation requirements of the populations.

In two days, however, one might hope to evacuate most of the cities of New York and Philadelphia into the safer reception areas. In the

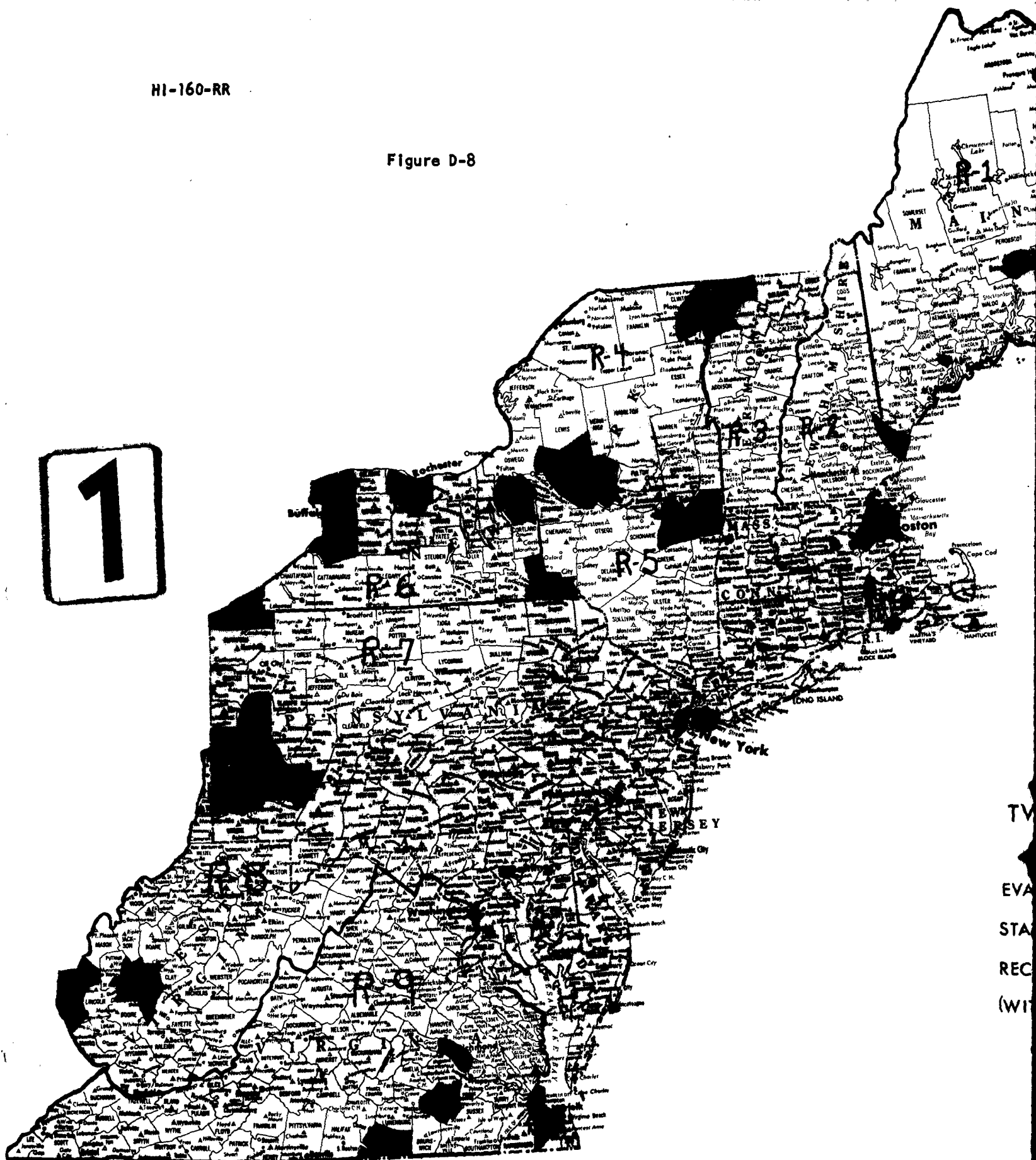
case of New York City, as shown in Figure D-9, automobiles would be driven on eight lanes through Connecticut and Massachusetts into New Hampshire, Vermont, and Maine and also on eight lanes into northern New York State. Both New York City and Philadelphia would avail themselves of the 12 lanes shown on Figure C-2 into northern Pennsylvania (R-7). These roads might carry, at 100,000 people per lane per day, 5.6 million people.

Using the rail capacity shown in the one-week schedule (Figure D-5), for the first two days, and empty freight cars, 300 trains carrying 1.95 million people might be taken partly to northern Pennsylvania and partly to Maine, New Hampshire, and Vermont. This movement could replace the more vulnerable and time-consuming trip to the Virginias as proposed in the one-week plan. In this way 75 per cent of the central cities of New York and Philadelphia could be evacuated and, in another 12 hours, with the expected increase in freight cars, the cities could be emptied. Meanwhile, on eight lanes going south, the 1.7 million combined population of Washington and Baltimore might be moved into Virginia. At the same time, evacuation areas on Figure D-8, such as Pittsburgh, Albany, Boston, etc. could be evacuated. This evacuation would leave many segments of the population in the most serious situation. It contemplates evacuating central cities, but not surrounding metropolitan areas, and leaving the people in many other areas subject to potential blast and fallout. This procedure can be justified in two ways. In the first case, the vulnerability might have been reduced by the construction of an extensive system of blast and fallout shelters which were, however, never intended for the large, and difficult to protect, populations of major cities. At the present time, however, this plan is better justified by priorities. By evacuating major cities first because of their assumed vulnerability as targets, road and rail capacities would be pre-empted. This is not strictly true, since there is a considerable road capacity for cities like New York and Philadelphia which can be used to disperse populations into adjoining areas. However, this has many disadvantages if the adjoining areas are, as in this case, likely to be severely threatened and if one wishes to hedge against the possibility that an attack will not occur in two days. We consider these disadvantages separately.

First, in this two-day evacuation, we imagine that the stationary areas on Figure D-8 would be engaged in hastily improvising shelters. The improvisation would be performed without knowing how much time might be available. The people of the entire area would be considered unsafe. Under such conditions it would be highly disruptive to their efforts to add large numbers of nearby metropolitan residents to their problem. It would be difficult for them to arrange for the care of evacuees in such a limited time. Also the improvised fallout protection would not be sufficient, and finally, the main evacuation routes will interfere with traffic and the scattering will interfere with itself.

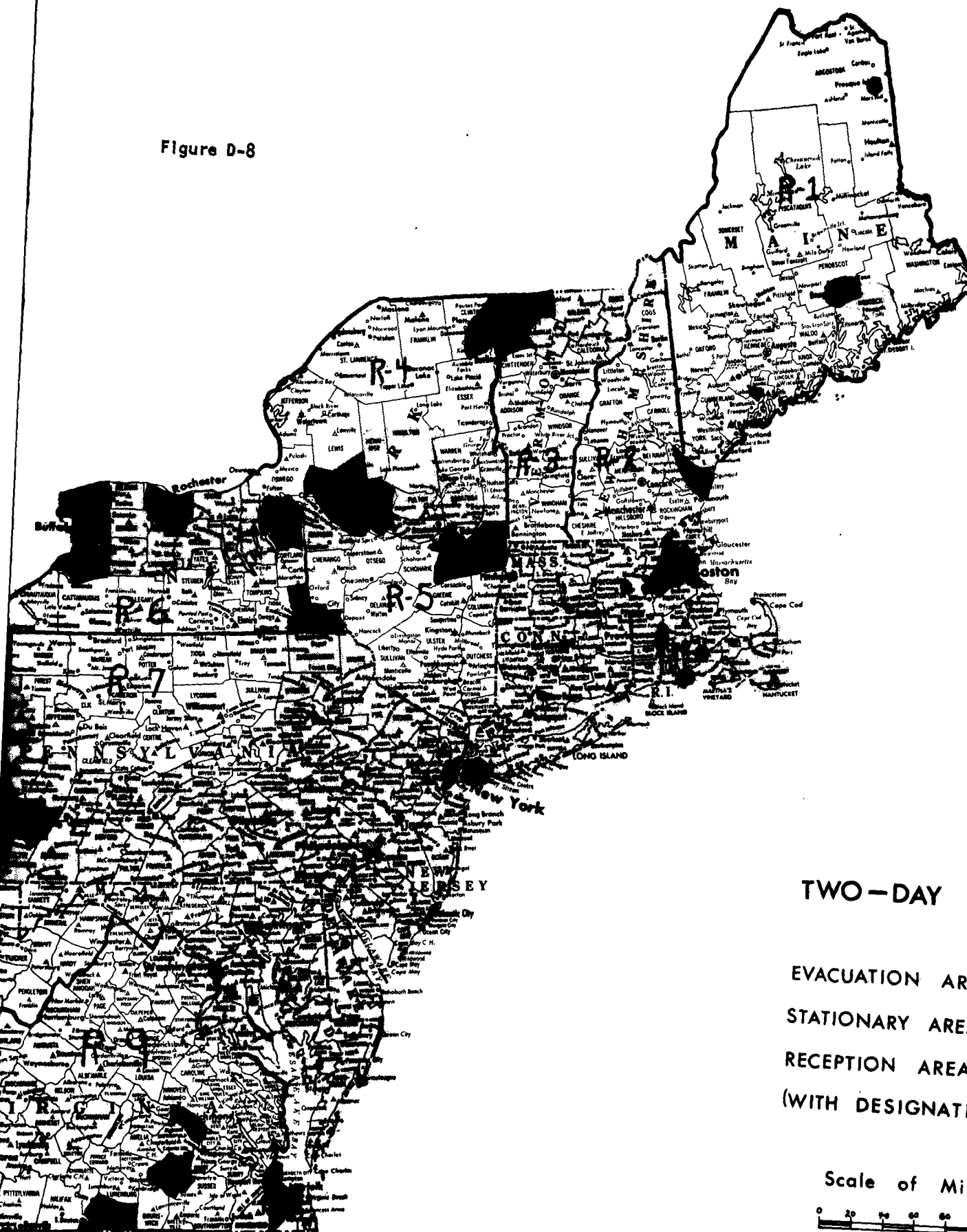
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Figure D-8



TV
EVA
STA
REC
(W)

Figure D-8



2

TWO-DAY PLAN

EVACUATION AREAS ■
 STATIONARY AREAS □
 RECEPTION AREAS □
 (WITH DESIGNATION)

Scale of Miles



Figure D-9

USE OF EVACUATION ROUTES IN TWO-DAY EVACUATION

<u>AREA</u> <u>(SEE MAP 2 FOR EXACT AREAS)</u>	<u>ROUTES USED</u>
NEW YORK CITY	3,4,5,6,7,11,12,13,14,15
PHILADELPHIA	16,17,18
BALTIMORE-WASHINGTON	31,32,33,34
PITTSBURGH	25,26,27,28
BOSTON	1,2
ERIE	23
BUFFALO	21,22
ROCHESTER	19,20
SYRACUSE	10
UTICA	9
ALBANY	8

Second, if one wishes to hedge against the possibility that an attack may not occur within two days, then one might want to be ready to phase into the one-week plan at the end of the two days. This plan may have been worked out in some detail on the assumption that the population distribution would be normal. To the extent that this is not the case, necessary adjustment would be made (a modified one-week plan might have been developed). In any case, if the population should be dispersed even though the two-day plan were initiated, we could start the third day of the one-week plan and go forward roughly as planned. Since the two-day plan involves a shorter turn around time for the trains, there will be slightly more freight cars available and the train schedule can be increased somewhat. On the other hand, if we permit dispersal, the population moves farther from the loading points expected by the one-week plan for filling trains and the difficulties associated with both controlling access to the evacuation routes and allowing scattered urbanites onto these routes become greater.

The two-day evacuation is, in itself, a hedge against the possibility that the situation might improve. Thus, if one really imagines war as imminent, there is considerable incentive for people in certain areas to hope that their area may not be attacked and thus to gamble on improvised shelter against the possibility of being caught on the road. This latter possibility is significant. The evacuation routes are long enough so that about 1/4 of the people to be evacuated in two days are on the road between their homes and the appropriate reception area boundary--assuming that things run smoothly. It must also be remembered that simply transporting an evacuee into the reception area will not locate him in a house where there is shelter. Thus, the two-day evacuation is, in part at least, undertaken as a stepping stone for a more complete evacuation.

The hedging is underlined by the fact that the two-day evacuation is so incomplete that it must be followed either by return or further evacuation. The protection afforded by evacuating the central cities but not the metropolitan areas of New York, Philadelphia, Washington, and Baltimore does not seem large enough to change the strategic situation and the protection afforded the people remaining is not great enough to make their remaining desirable. If this reasoning be accepted, then the two-day evacuation not only hedges against the possibility that the situation will improve, but demands certain actions in that case. Thus, some plan like the one-week plan inevitably follows to exploit the opportunity afforded by additional time.

This leads us to compare the one-week evacuation with the results of following up the two-day evacuation with that plan. We shall refer to the latter plan as the "two-day extended plan." The one-week plan completes the evacuation on the same day, but leads to a less desirable distribution of population. This would not be critical if the expectation of war has decreased steadily from the initiation of the two-day

plan to the initiation of the one-week plan and thereafter. If, however, an attack should occur on the seventh day, the one-week plan would have been preferable. On the other hand, if the attack should occur after a few days and is not so extensive as the attack assumed, the two-day extended plan will have exploited that fact by emptying the major industrial targets at a faster rate and by encouraging improvised shelter building in the stationary areas.

Differences between the two plans are minimized if it is assumed that the stationary areas already have a significant shelter capability, or if one imagines the one-week plan might be initiated with the provision that the population leaving on later days improvise shelter while they wait. There are probably some difficulties, however, in assuming that some people can be encouraged to prepare for flight while others in the same area, and depending on their scheduled departure, prepare to stay. In order to make the problem of controls more manageable, one tends to assume that the plans are clearly consistent with the mood and perception of the situation which is commonly held. Therefore, among homogeneous groups of people, it may not be wise to assume wholehearted attempts to achieve protection in different ways.

Many problems of control which exist in the one-week plan are more complicated in the two-day plan. This latter plan is carried out in such a threatening atmosphere that many persons will be tempted to give up controlling functions in favor of protecting their families and themselves. Motorists might be expected to be in too much of a hurry to allow traffic to flow smoothly and relatively safely. The emergency unloading of freight cars, the importance of which increases if an attack should not occur for a few days, might be impeded by the failure of work gangs to report. The tendency of evacuees to stop at the first seemingly safe place or at the nearest part of the reception area could lead to overcrowding of a very serious nature. Another important aspect of control is the degree of understanding of the plan achieved by the average participant. So far, the average citizen has absolutely no conception of his role in any such plans. It seems difficult to imagine his becoming aware of two plans and their implications for him in terms of roads and reception areas, scheduled departures, etc. One might prefer to put one's faith in one plan, probably the one-week plan, until its contents became sufficiently well understood to facilitate instructions about an alternative. On the other hand, these difficulties could be overcome by passing out to each possible participant printed sheets detailing his responsibilities under each plan.

The two-day plan is very dependent on the weather. While an evacuation over a week might expect to encounter some rain, it would probably not rain all week. Also, except in unlikely circumstances, the roads might be kept free of snow most of the time during a week. The two-day plan, however, could be completely unsuccessful in the event of extremely bad weather.

The two-day plan is very dependent on previous preparations, especially in the reception area. Although it is estimated that there would be a 10 to 14 day supply of food in a city like New York, the two-day departure schedule makes it difficult to take full advantage of that fact. Thus, food would have to be very systematically stockpiled in the reception areas. The shelters in the reception area will be difficult to improve significantly in the short time available. For the average evacuee, the time available for improvement will be only a few hours after he has spent most of the time to reach a reception area and to find shelter.

Stocking of gasoline stations for the two-day plan and the one-week plan do not represent different difficulties since the same roads are to be kept open, although in some cases for different traffic. The stations have to be refilled several times a day in either case, so that there is no extra benefit attached to the shorter two-day plan.

The capacity of the railroad is not materially different in the two-day case because of the shorter turn around time. Instead of instituting the two-day plan, a possibility not examined here would be to continue to move evacuees to the nearest reception area without regard to the population densities in order to maintain a lower turn around time and to increase the rate of arrivals at the reception areas. This would create more difficult housing problems and make the reception areas R-1, R-2, R-3, R-6, and R-7 more desirable population targets.

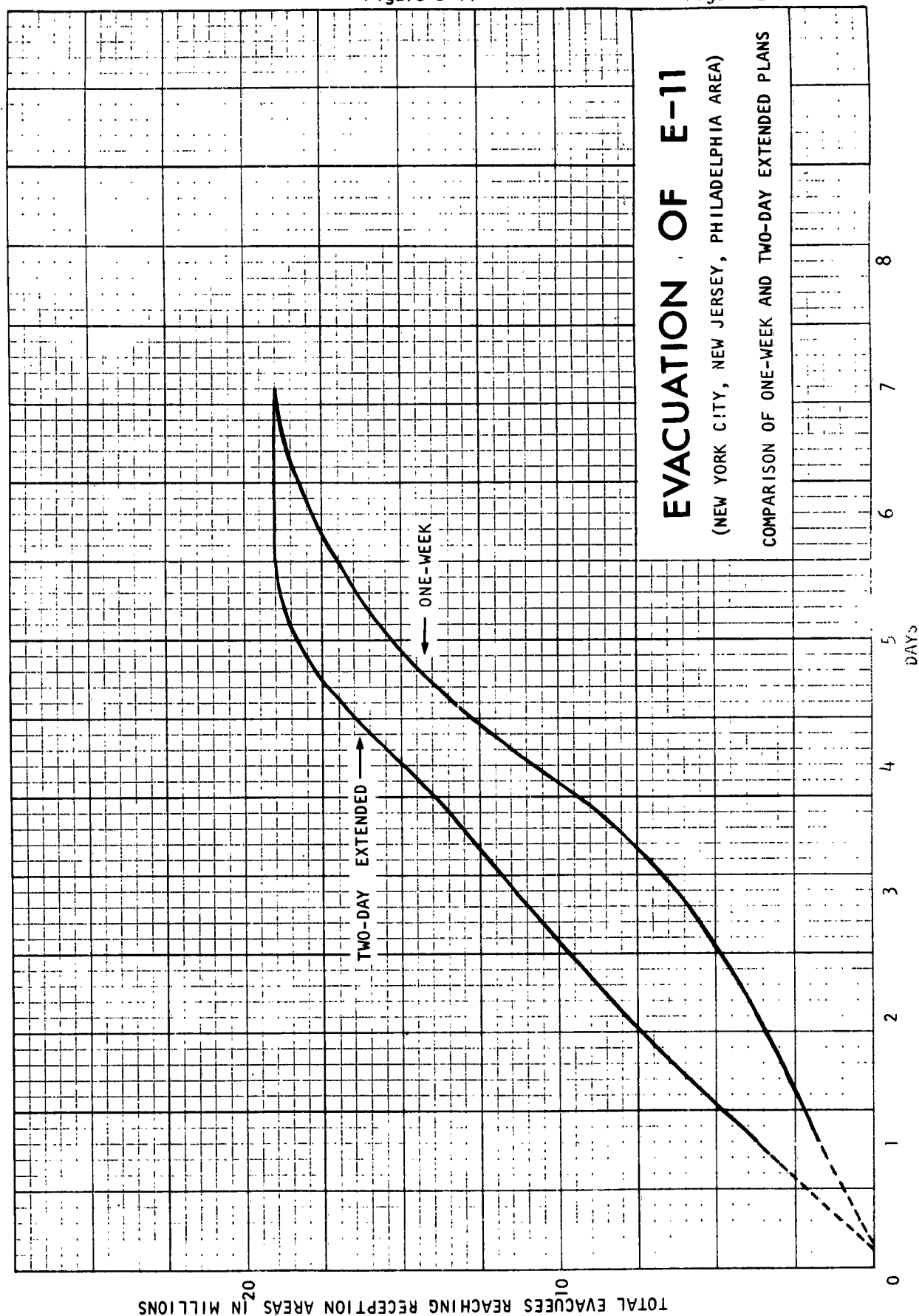
Figure D-11 compares the rate at which the E-11 evacuation area population reaches reception areas in the two-day extended and one-week plan. The two-day extended plan starts off using all available roads with the highest priority and this heavy use of automobiles conceals the accelerating effect, seen in the one-week curve, which is due to the increasing numbers of boxcars which would become available in the first few days.

In Figure D-10 the more detailed information is given on the comparison between the two plans. A higher density in northern reception areas and a lower one in southern areas is envisioned for the two-day extended plan. The effect of using road capacity in a "panicky" way without regard to housing is shown in the 11:1 ratio suggested for Vermont.

The over-all rate at which evacuees reach the reception areas from all points would be quite similar in the two plans because it would be determined largely by the roads and trains available. The change in the distribution of their use produces the different curves for Evacuation Area E-11 in Figure D-11.

Figure D-10
COMPARISON OF POPULATION DISTRIBUTION IN RECEPTION AREAS
FOR THE ONE-WEEK AND TWO-DAY EXTENDED PLANS

RECEPTION AREAS	POPULATION BEFORE EVAC. (Millions)	POPULATION AFTER ONE-WEEK EVAC. & EVAC. TO RESIDENT RATIO (Millions)		POPULATION AFTER 2-DAY EXTENDED EVAC. & EVAC. TO RESIDENT RATIO (Millions)		PEOPLE PER SQ. MILE		
						BEFORE EVAC.	ONE-WEEK EVAC.	2-DAY EXTENDED EVAC.
R-1 Maine	.85	5.97	6.0:1	5.87	5.9:1	30	220	210
R-2 New Hampshire	.53	3.93	6.4:1	5.41	9.2:1	80	570	780
R-3 Vermont	.21	1.56	6.4:1	2.14	9.2:1	40	320	440
R-4 Northeastern N.Y.	.58	4.26	6.3:1	3.92	5.8:1	40	290	260
R-5 Southeastern N.Y.	.58	3.92	5.8:1	3.97	5.8:1	70	470	480
R-6 Southwestern N.Y.	.63	4.66	6.4:1	4.98	6.9:1	50	350	370
R-7 Northern Penna.	.85	6.23	6.3:1	6.69	6.9:1	60	440	470
R-8 West Virginia	1.59	8.84	4.6:1	7.75	3.9:1	60	410	360
R-9 Virginia	1.98	10.72	4.4:1	9.33	3.7:1	60	300	260
TOTAL	7.80	50.09		50.06				



D.3 One-Month Escalation

One can easily imagine the international situation deteriorating over much longer periods than are implied by the two-day and one-week plans. There are many ways in which this could happen, and as many ways to try to meet the dangers and costs of the situation.

An example of a possible escalating crisis basic to our discussion might begin with active Soviet efforts to restrict the access routes to Berlin after a series of crises and in a period of high tension. This could usher in a period in which serious civil defense preparations might be made. If this were followed, for example, by a Soviet attack on Berlin, one can imagine 30 per cent of the population in large metropolitan areas leaving for the reception areas without disrupting normal traffic. A subsequent invasion of West Germany, followed by a spreading conventional war with NATO forces, might lead the Government to initiate the one-week plan. If a missile attack on our military bases came later, attempts might be made to evacuate the 10 per cent left in critical areas before bomber attacks might begin. This section attempts to indicate the effect on evacuations of such a sequence of events. Such a sequence of events may happen to take a month but does not represent the working out of a one-month plan, i.e., a plan appropriate to the supposition that a war might occur in a few weeks to a month. (Instead its purpose is to illustrate an escalation.)

The month situation might be said to begin with intensive preparations for civil defense which are not associated with any movement for 10 days. Unlike the one-week plan, an attack is not expected at the end of the period but rather a lessening of tension or an increase of tension and further preparations. With the expectation of 10 days to prepare and without a deadline of an anticipated attack, the situation is materially different from the one-week case. It seems reasonable to expect persons in areas which are potentially dangerous but which are not industrial centers or military targets to prefer to build substantial shelters during this period. This is not the hasty improvisation undertaken by large areas in the two-day plan because the capacity for transportation would have already been pre-empted by metropolitan areas. Instead this represents the anticipated desire of many people to remain at home in a period in which transportation is available and to hedge against the danger by trying to build a shelter in an amount of time which is expected to be adequate for its construction. In the industrial and military centers one might expect heightened preparations for flight, including stockpiling food, repairing cars, distributing information, studying evacuation plans, recruiting for control functions, and the like.

In general, the entire Northeast area would be hedging in hopes of a decline in tension. Without this possibility, a plan more like the one-week plan would be appropriate. On the other hand, the one-week

plan poses enormous economic and psychological costs to the country and to the individuals concerned, which provides ample motivation for equivocating. The tension might subside at the end of 10 days and it might not. In the former case, no further action would be taken; in the latter case, it would be appropriate to consider evacuating some percentage of the population, e.g. 30 per cent. The proportion of the population evacuated and the manner and speed with which it is done would be highly sensitive to the prevailing trends in the situation. For example, whether families would be separated or not might become a matter to be encouraged or discouraged nationally. These questions might become academic if the situation were tense enough to induce a large percentage of the population to leave on its own initiative. The problem would then become one of controlling the exodus or not. These points are discussed elsewhere, so assume here that, over a period of 14 days, 30 per cent of the population in the evacuation areas shown in Figure D-12 leaves for the reception areas. This is 12.3 million people.

The evacuation areas are conceived as smaller than those of the one-week plan, since many areas would have been building shelters. The reception areas still contain 8 million people. In the stationary areas there are 9.95 million people; in the evacuation areas, 36.9 million people. Figure D-14, below, denotes the areas appearing there in a self-explanatory way and shows the population of the evacuation areas and the day on which different aspects of the evacuation would be completed, assuming that 30 per cent evacuation would start on the eleventh day.

We imagine that the evacuees leave on the usual evacuation routes, but in the normal lanes and at a rate not disruptive of the usual traffic--about 25,000 people per lane per day. This is 6,250 cars with four persons to a car. The average is high for a situation without controls, as this might be, but may be compensated for by the possible use of trucks and busses. Meanwhile, we assume that the government would put 2,500 railroad passenger cars at the disposal of evacuees, each seating 75 persons, and carrying 25 standees, which can be re-used with 1-1/2 day turn around time to evacuate about 170,000 people each day. (In fact, there might be 1,000 more railroad passenger cars available.)

After the evacuation, and depending on the world situation, domestic reaction to the evacuation, the weather, and other factors, the 30 per cent might (1) return to their homes, (2) continue to stay in the reception areas, or (3) be joined by other evacuees. If the situation deteriorated at any time during this phase of the evacuation, the one-week plan or the two-day plan might be instituted. Each of these would give rise to different rates of evacuation in different areas and to different densities in reception areas. Figure D-13 shows the result of entering upon the one-week plan after the 30 per cent evacuation.

Figure D-12

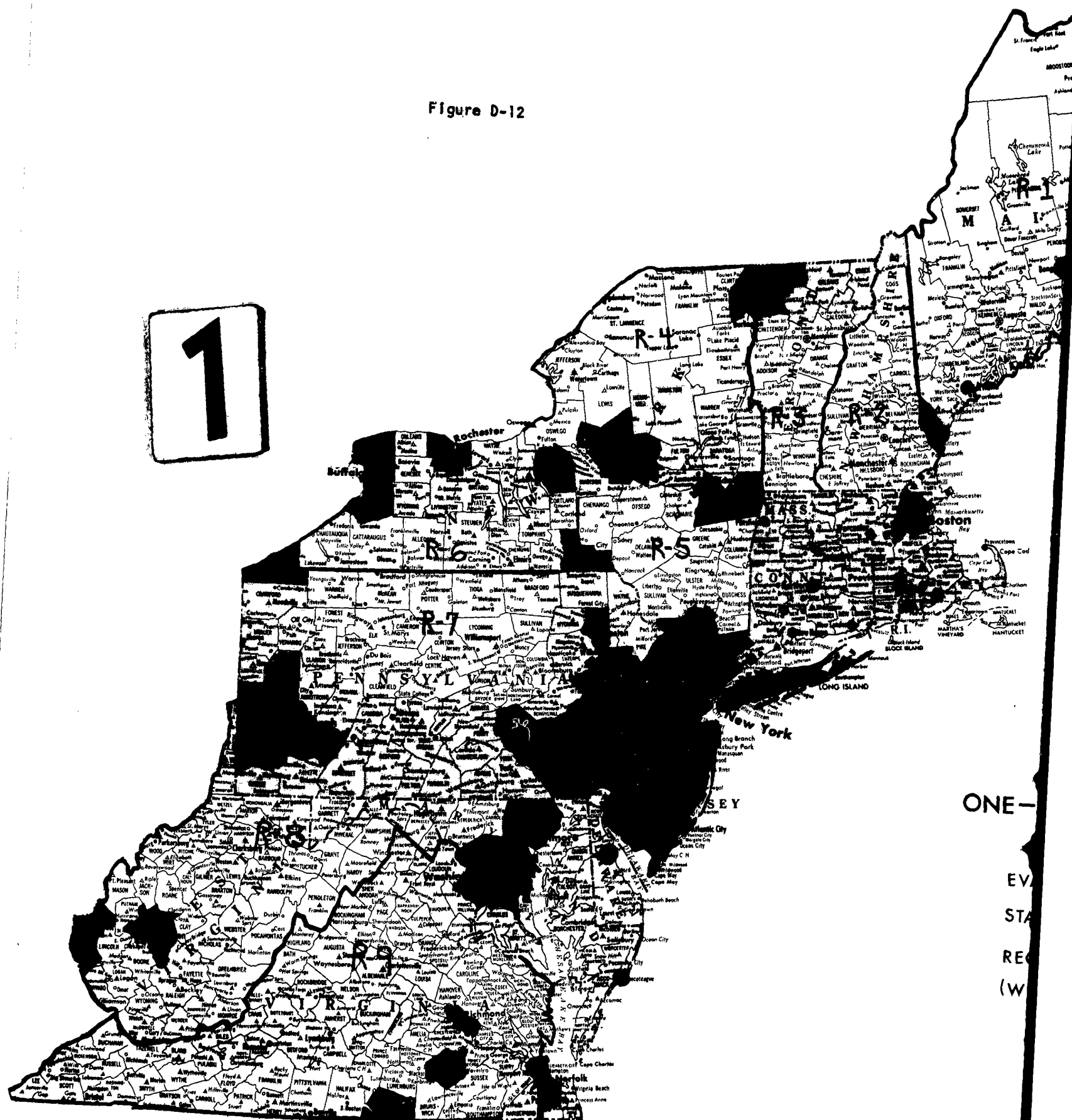


Figure D-12

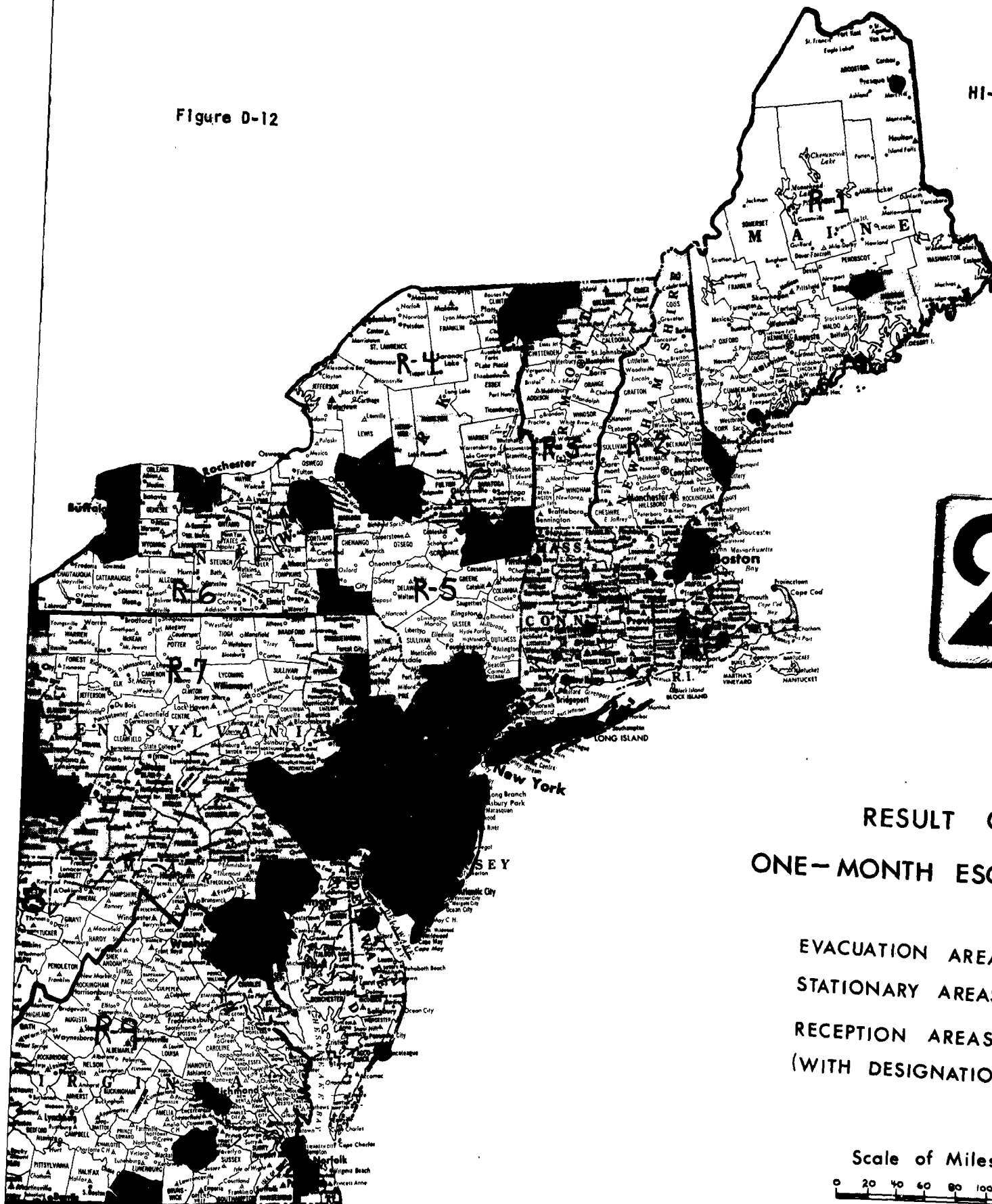
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2

RESULT OF ONE-MONTH ESCALATION

EVACUATION AREAS ■
STATIONARY AREAS □
RECEPTION AREAS (WITH DESIGNATION)

Scale of Miles
0 20 40 60 80 100 120



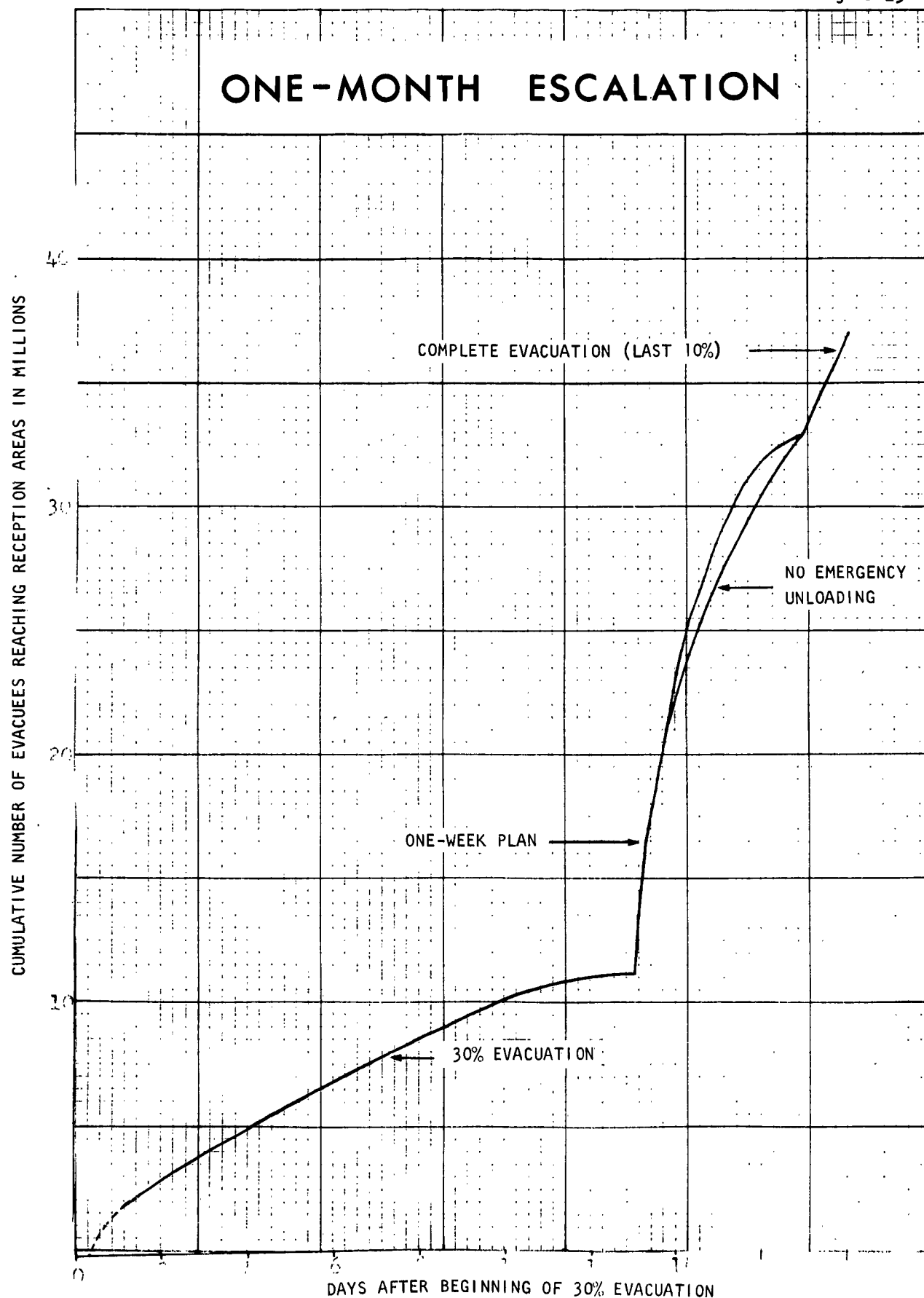


Figure D-14

SUMMARY OF ONE-MONTH ESCALATION

<u>EVACUATION AREAS</u>	<u>POPULATION (Millions)</u>	<u>DAYS REQUIRED FOR:</u>	
		<u>30% EVAC.</u>	<u>EXTENSION TO 90% EVAC. USING ONE-WEEK PLAN</u>
NEW YORK-PHILADELPHIA- NEW JERSEY	22.15	13	4
PITTSBURGH	2.17	7	2
ERIE	.25	3	1
BALTIMORE-WASHINGTON, D.C.	3.73	9	3
BOSTON	1.25	6	2
BUFFALO	1.30	8	2
ROCHESTER	.59	4	1
SYRACUSE	.42	6	2
UTICA-ROME	.31	6	1
ALBANY-SCHENECTADY-TROY	.56	7	2
OTHER EVACUATION AREAS	4 13	1	-
TOTAL IN EVACUATION AREAS		36.86	
TOTAL IN STATIONARY AREAS		10.16	
TOTAL IN RECEPTION AREAS		7.80	
TOTAL IN ALL AREAS		54.82	

This plan might be invoked with emergency jettisoning of cargoes or it might rely entirely on empty boxcars. These two possibilities are shown separately. After the evacuation is completed, there might be a period without movement while the situation in the world was clarified. Imagining that this period led to still greater fears, the remaining 10 per cent of the population might be evacuated to the extent that this was possible. The possibility depends on the immediacy of a possible attack, the national requirements involved in keeping the country running if an attack does not come, the desires of many people to take their chances and stay at home, and other considerations difficult to measure. The time required to evacuate the remaining 10 per cent depends somewhat on their preparation, but one can at least count on large numbers of cars and empty freight cars for the purpose, so that the evacuation could be quite rapid. It would be a matter of a few hours in all evacuation areas except in the New York-Philadelphia-New Jersey area. In that area less than a day would be required. The total estimated effect is shown in Figure D-13.

This discussion assumes that in those areas where people were content to build shelters during the first, relatively calm, week they continue to remain at home. Last minute changes of mind as a result of threats to broaden the scope of a crisis or war, for example, would make large differences in these examples.

A summary of the one-month evacuation appears in Figure D-14.

D.4 Evacuation Contingency Planning

An evacuation might be thought of as having four or five phases depending on whether or not a war occurs and a shelter period is required. These phases might be termed:

1. Preparation
2. Transition
3. Waiting
4. Shelter
5. Return

The plans and preparations may have been of long standing as we assumed was the case in the one-week and two-day evacuations. Alternatively, many preparations might be undertaken during a tense period as was imagined in the one-month crisis escalation. The preparations might be such as to make a single set of evacuation plans feasible or they might be extensive enough or sufficiently well chosen to permit changes of plans and alternative kinds of evacuations as might later be found desirable. Thus, plans and supplies appropriate to quickly improvising shelters in high-fallout areas might preserve a decision-maker's choice between the two-day and two-day extended sequence on the one hand and the one-week plan on the other. The kinds of preparations made will also determine, in some measure, the length of the period of transition.

For example, careful plans to close off access to evacuation routes will be crucial in determining the rate at which millions of people could leave the critical New York-Philadelphia-New Jersey area. Stockpiling of food is a preparation which would affect the possible length of a waiting period. Instructions on shelter building will significantly affect the quality of shelter available. If a war should occur, preparations for decontaminating, repairing, and rebuilding roads would most likely affect the timing and rate of return.

It is thus clear that the kinds of preparations made are very dependent on decisions and goals connected with the other four phases. Whether given phases are to be long or short, comfortable or uncomfortable, or simply feasible or infeasible in different contingencies, pose questions which should be answered before sensible preparations can be made. Thus decisions on preparations will be influenced by decisions concerning the next four phases.

During the transition period, evacuees move from the evacuation area to the reception area and persons in other areas are engaged in final preparations at home. The transition periods should be kept short unless other considerations dictate otherwise. (There may be reason to carry out the movements in a slow, measured way so as not to frighten an enemy into thinking he faces a first-strike situation before he has a chance to soften his position.) Among other things, the transition periods depend considerably on the distances which one must travel, the waiting period possible in different areas to which transition might be made, and the difficulties of return from possible reception areas. The preparation that has already been made is, of course, crucial.

By the waiting period is meant the time between arrival at the reception area and an attack or signal to return. In discussing this period, one is usually interested in determining its maximum potential length since this provides an element in bargaining which can hardly loom much smaller than the role of the evacuation itself. Besides the length of the waiting period, there are other important aspects such as the domestic political effects of uncomfortable periods in reception areas and the economic effects of the dislocation.

The shelter period is the time between an attack, if it comes, and exit from shelter. This period can be very specifically delineated since one typically leaves shelters to a greater and greater extent as time goes on. The length of this period is determined for the most part by the character of an attack and the amount of fallout, but it is also controlled by the extent of preparations which facilitate shelter existence.

The return phase follows the shelter period, assuming return is possible, or the waiting period if a crisis should be resolved without a thermonuclear attack. The difficulties associated with it are quite

different in the two cases. If no attack has occurred, the return is presumably carried out in the same way as the exodus. However, when heavy use of the railroads is involved in evacuation, as in the circumstances considered here, people might return at a more leisurely pace than they had come, using trucks and busses while the trains return to normal schedules. This might be prompted by strategic reasons if a slower-paced return should seem desirable. Discussion of the return after a war must be sensitive to the nature of an attack. Damage and fallout might range from insignificant in certain areas to being so highly destructive in other areas as to bar return. Judgments concerning return arrangements involve, among other things, decisions on the transition periods affecting the exodus and the preparations made.

All phases of an evacuation not only depend on decisions affecting one another, but must also be considered in the light of:

1. Vulnerability of the population
2. Strategic situation vis-à-vis an adversary
3. Political situation.

By the vulnerability of the population is meant its susceptibility to different kinds of attack--nuclear, conventional, bacteriological, chemical--during phases two, three, and four. This consideration is complicated enough without interrelations with the others. Typically, a short evacuation in the Northeast will decrease vulnerability in the transition phase only to increase it during the waiting and shelter periods. One can even imagine evacuations carried out in steps, each involving short transition periods and successively less vulnerable waiting periods. The two-day extended evacuation does this in a sense.

A strategic situation vis-à-vis an adversary refers to all those political and military considerations of bargaining, stalling for time, threats to enlarge the scope of a possible war, and other aspects of the tacit or overt negotiations which may follow an evacuation. In these negotiations all aspects of the evacuation, as well as the issues giving rise to it, will be material. In particular, however, the vulnerability of the population and the limits on the waiting and transitional periods will be important.

Under the political situation, the cues for evacuation and de-evacuation, the domestic pressures arising from the evacuation, the political effects of increases, decreases or stabilizations of tension and other similar elements of executive decision would be discussed.

These considerations indicate how complicated an evacuation can become. The complications are compounded when one wishes to retain a great deal of flexibility in the choice of plans at each stage of an evacuation. For example, one can imagine a situation in which the transition period suddenly seems to be taking too long in view of the rising tension. Therefore, it may be necessary to forego adequate

preparations in order to telescope the transition time. It is unfortunately equally easy to imagine evacuation plans which admit of no such change once they are initiated. Plans which involve long train or car evacuation routes through areas without shelter are examples. The fitting of different possible plans together to give flexibility involves a trade-off between the advantages to be gained by pursuing a single plan without the possibility of change (with a "long range" goal in mind) and the advantages to be gained by keeping plans flexible and suitable to the immediate needs of each of the five phases.

An example of this occurs in the comparison between the results of the one-week evacuation which proceeds steadily to spread out the population in a fairly even distribution, and the two-day extended plan which, at the end of the week, has distributed the population somewhat less well, but has shortened the transition period for the part of the population most in danger. This sort of trade-off is described by saying that the two-day extended plan hedges against the possibility of a war during the transition period which might be aimed at the metropolitan areas, at the cost of a poor distribution of evacuees. Alternatively, one might say that the one-week plan hedges against a long waiting period (during which uneven distribution could be quite onerous) at the cost of vulnerability during the transition period. Hedging is not necessarily a trade-off between two unpleasant situations. It may arise because of a desire to be in a position to exploit a situation. In this way we have imagined part of the metropolitan population refraining from dispersing into only slightly less dangerous areas in the two-day plan in order to hedge against the possibility that war will not come immediately, in which case cities will be better disembarkation points for the reception areas.

The exploiting of a more favorable situation than might necessarily happen is a possibility worth being prepared for. In a one-month escalation, the evacuation of some non-essential persons would go on at a rate which would not interfere with other preparations (which one imagines as exploiting the relatively slow growth of tension). As another example, the emergency unloading of boxcars in the two-day evacuation would play no role in the two days during which an attack would be expected because the boxcars under consideration would not begin to arrive in time. If the attack should not come, however, the extra boxcars could play an important role in exploiting the extra time to extend the evacuation.

It is impossible to keep all possibilities open and to maintain a position which is completely flexible. In preparations and in plans, expenses, inconsistencies and logical impossibilities prevent it. Choices must be made; and where they must occur, plans branch. These branch points might involve a decision to empty boxcars at great cost to the economy, an alternative in the one-week plan. Once this decision

has been made the costs are incurred and certain handicaps to quick evacuation greatly diminished. The length of time that will be needed to start the economy up again after such a move has not been estimated here. It is nevertheless an example of the information associated with this branch point which any decision-maker would need.

A branch point is typically associated with an irrevocable decision which incurs expenses, closes off options which may have been previously left open at some cost, and leads to new choices and options. Much of the branching which might exist in evacuation situations concerns relaxing of tensions. In our particular examples, the two-day extended plan would involve a decrease in tension after two days, while the one-month escalation could anticipate continual increases in tension. In general, however, one tends to ignore those branches which assume or lead to relaxation of tension as circumstances posing no difficulties. This is probably a mistake. Consider the difficulties associated with issuing an order to return from an evacuation. What is the cue for such an order? What guarantee does it require? (If these were simply political questions they would not need to be considered here.) Since they involve the vulnerability of the population, the possibilities of re-evacuation and various complicated transitions, they become matters of importance to this study.

Whether the tension does increase or decrease, it must be remembered in considering evacuations that they are abrupt and destabilizing moves in a tense and possibly confused situation. Along with advantages, an evacuation may also bring disadvantages: violent threats, political upheavals, and difficult deadlines inherent in the capacity of the evacuation to be maintained. Anyone advocating an evacuation must therefore put the greatest emphasis on flexibility and on the development of a plan which hedges against many uncertainties. These considerations are as important as the technical feasibility of the plan itself, since a likely correct but inflexible plan could easily lead to disaster. Hence, at the present level of understanding of strategic evacuation, the investigation of evacuation contingency planning must be carried out to parallel each particular plan.

Evacuation Effectiveness

The effectiveness of an evacuation depends in part on the reasons which one gives for undertaking it. If the evacuation need only be a façade to further frighten a lightly armed adversary who doubts our resolve, its capacity as insurance may not matter. Objective measures of its ability to save lives against certain types of attacks could become important. If, for example, the evacuation is supposed to protect lives against an adversary who may attempt to kill population, it becomes very important that the evacuation be capable of saving lives against malevolent and carefully thought out "optimal" attacks. In this section we make some rough computations designed to measure the extent to which the one-week plan has made the destruction of population more difficult.

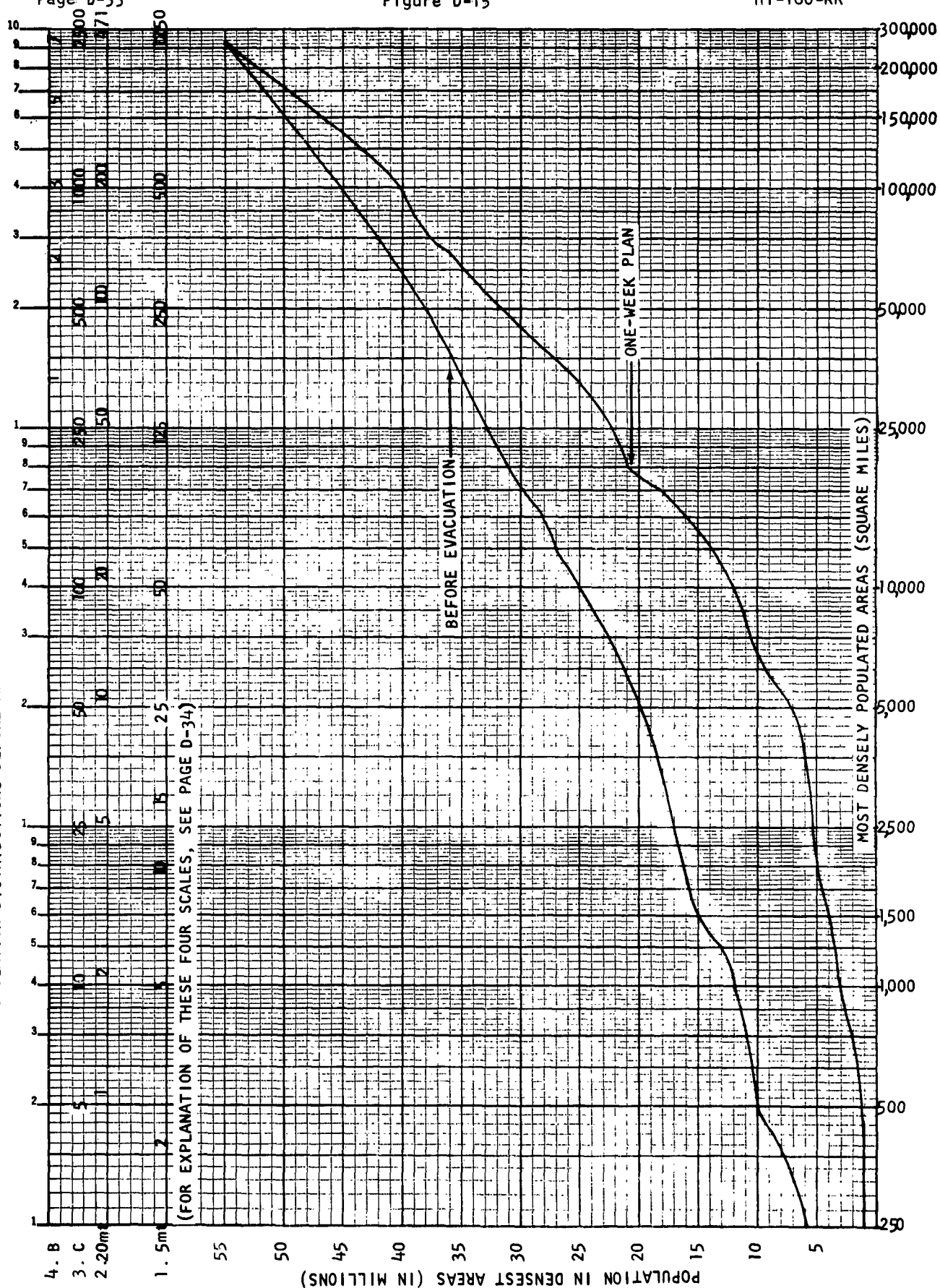
The conclusions seem to be that evacuations of the type considered in the report (those which move many people into improvised protection in rural areas) give substantial protection against attacks on population which are incidental to a general war. These attacks might involve the destruction of several large cities by accident or design, or because they were part of military systems. However, the evacuation is not as much protection as one would expect against all-out thermonuclear attacks directed toward population or against the use of other killing agents. The exact degree of protection provided the population in our study depends closely on:

1. The degree of radiation protection--calculations for protection factors of 10, 20, 50, 100, and 200 will be presented.
2. The amount of time spent in the shelter--calculations for two weeks, one month, and two months will be given.
3. The number of megatons diverted to population attacks.
4. The use of other killing agents (e.g., chemical, bacteriological).

These factors are considered in the following discussion.

The fundamental result of the one-week and two-day evacuations is shown in the first graph, Figure D-15. The curves indicate the number of people living in the most highly populated x square miles before evacuation and after the one-week plan.⁽¹⁾ The extent to which evacuation has decreased the density and spread the population out is apparent. The one-week plan is shown consistently below the curve representing the distribution before evacuation. The evacuation has the advantage of having about 10 million fewer people in the most populated 1/10 of the area (23,000 miles). If attacks begin to cover a wider area than this and are restricted to the densest areas, the difference in the number of people who are under attack in the unevacuated population and in the one-week plan diminishes. When the area under attack approaches 40 per cent of the total, the difference has diminished to about 5 million and it continues to diminish as the scope of the attack widens. There are several ways in which this comparison underestimates the effectiveness of the evacuation. First, it does not indicate the great difference in potential effect of a very few bombs aimed at an unevacuated population in large cities. Second, it ignores the fact that the evacuation has separated the population from the industrial areas. These industrial areas, as very densely populated areas, are contributing population to the beginning of the before evacuation curve. After evacuation, these cities contribute to the end of the one-week plan curve. This provides a potential attacker with a choice instead of "bonus" destruction. Nevertheless, attacks on population which ignore built up areas are more effective than one

POPULATION DISTRIBUTIONS BEFORE AND AFTER EVACUATION AND SOME ORIENTING SCALES



might expect. The scales provided below Figure D-15 are meant only to be orienting, since they ignore the placement of the reception areas and their shape. In the discussion to follow, a more detailed account of the effects of shelter and fallout are given so that the remarks made here are restricted to blast effects, chemical, and bacteriological warfare. For this purpose, scales are shown to indicate the efficiency of various methods of population attacks.

Scale 1: In the first scale, five megaton bombs are considered to have done serious damage to our improvised shelters within the 2 psi circle associated with a ground burst (which will contain about 200 square miles). The 2 psi circle is chosen because the basements used in the plan are at least partially sealed off to increase their capacity as shelters and the first floors above them have earth piled upon them. These two factors tend to make the shelters easier to collapse than they would ordinarily be. After collapse, relatively low levels of radiation could kill the population. The bombs are assumed ground burst to provide fallout. This reduces the 2 psi radius from 13.5 miles to 8 miles.

Scale 2: In the second scale, 20 megaton bombs are used again with a blast circle associated with 2 psi and ground bursts. These circles contain about 530 square miles.

Scale 3: The third scale assumes that a B-52 or its equivalent can carry enough chemical agents to cover an area of 100 square miles. The scale indicates the number of plane loads necessary to cover a given number of square miles. The result of such an attack is about 30 per cent morbidity.⁽²⁾

Scale 4: The fourth scale assumes that a B-52 or its equivalent could carry 450 pounds of biological agents and affect at least 34,000 square miles.⁽³⁾ The epidemics might spread to other areas and would incapacitate 25 to 75 per cent of the population in these areas. The effects of a sheltered population should be considered in discussing the propagations of disease, but we have ignored this.

In the next two graphs (Figures D-16 and D-17) we show the effect of shelter protection against thermonuclear attacks. Our assumptions follow those in Distribution and Effects of Fallout by Hugh Everett, III and George E. Pugh.⁽⁴⁾ In that paper it is assumed that bombs are dropped at random into different areas which are large with respect to the effect of any one bomb. The attacks in a given area are then characterized by the density of megatons dropped in the area (megatons per 10,000 square miles, $2/3$ fission yield). The conclusions drawn by Everett and Pugh have been used in constructing these graphs. In particular, it is assumed that the results of the random attacks are a 24-hour integrated dose whose logarithm is normally distributed with mean standard deviation dependent only on the density of the attack and having the form shown there.

In constructing the population response against attacks where significant protection factors are involved, it is very important to specify the amount of time spent in the shelters. As the shelter periods get longer, it may be important to discuss the recovery rate from radioactive exposure as a function of time. Since this material is so little understood, such effects are ignored and we have simply accumulated the exposure of the population for a period of 60 days under various assumptions about shelter occupancy and ignored the doses received thereafter.

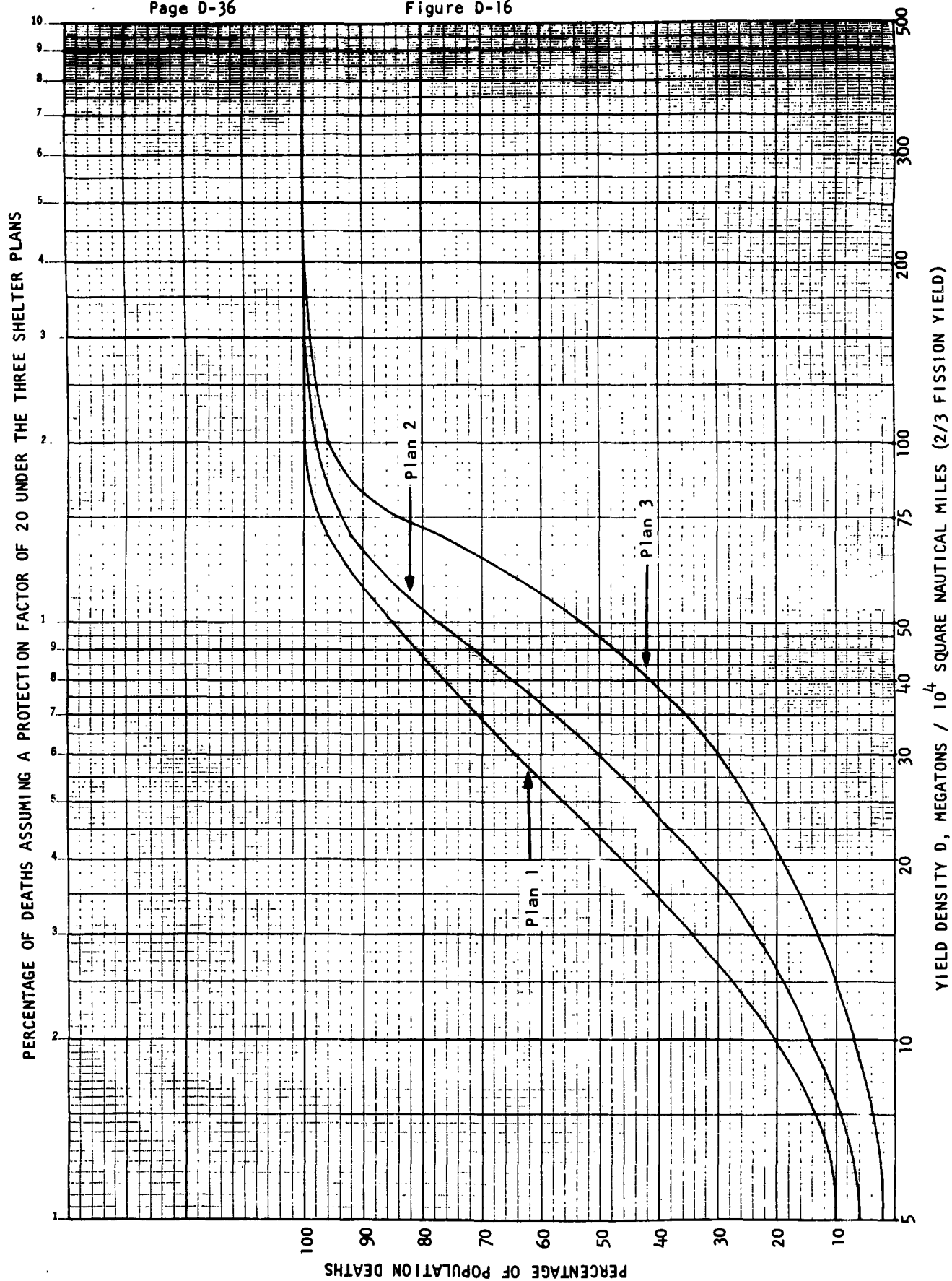
It seems proper to assume, in agreement with our other assumptions in the plan outlined, that very little preparations have been made for the evacuation. Having made this assumption, and since 15 to 35 people will be in each basement in the reception areas, it is very important to consider the effects of their leaving the shelters prematurely through necessity or ignorance. These problems also highlight the periods of shelter occupancy which are necessary. We have considered three situations. In all cases we ignore the effects of fallout after 2 months. This is a mistake for heavy attacks. On the other hand, against such attacks exit from shelter might be kept to lower levels than we have assumed. The three plans considered are:

Plan 1: The occupants are in the shelter for two weeks, and for the next six weeks spend only 1/2 their time in the shelter;

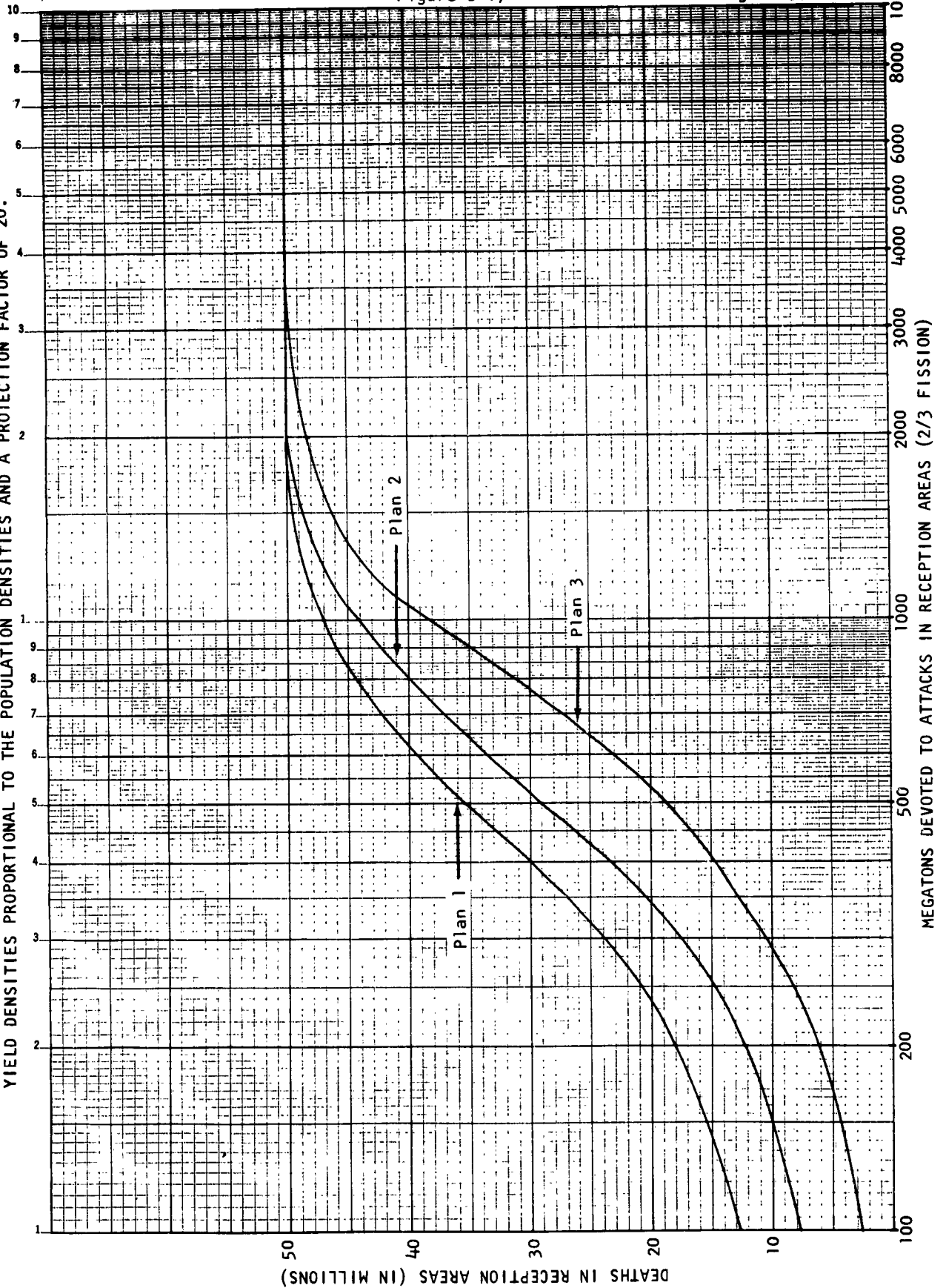
Plan 2: The occupants are in the shelter for one month and for the next four weeks spend 1/2 of their time in the shelter;

Plan 3: The occupants are in the shelter for the total two months considered.

In Figure D-16 we have plotted the percentage of deaths against the weight of the attack for these three plans and assumed shelters with a protection factor of 20. This graph shows that an intermediate range exists from about 20 megatons per 10,000 square miles to about 50 megatons per 10,000 square miles in which the period of shelter occupancy is very important in saving lives. In this range, at least 30 per cent of the population might be saved by the ability to stay in shelters for two months rather than two weeks. In Graph D-17, the results of attacks on the reception areas are shown if the shelters and periods of occupancy are as described. Since evacuation areas are ignored, the computation might be interpreted as assuming that the 10 per cent in the evacuation are very secure in the best shelters available in their now thinly populated localities. These localities provide poor targets because their density is usually quite low compared to that of any reception area (see Figure D-17). The reception area densities after evacuation vary by no more than a factor of two. The distribution of megatons to areas has been done in proportion to population density. However, the reception areas such as Maine with very



DEATHS RESULTING FROM ATTACKS IN THE RECEPTION AREAS AFTER THE ONE-WEEK EVACUATION WITH
YIELD DENSITIES PROPORTIONAL TO THE POPULATION DENSITIES AND A PROTECTION FACTOR OF 20.

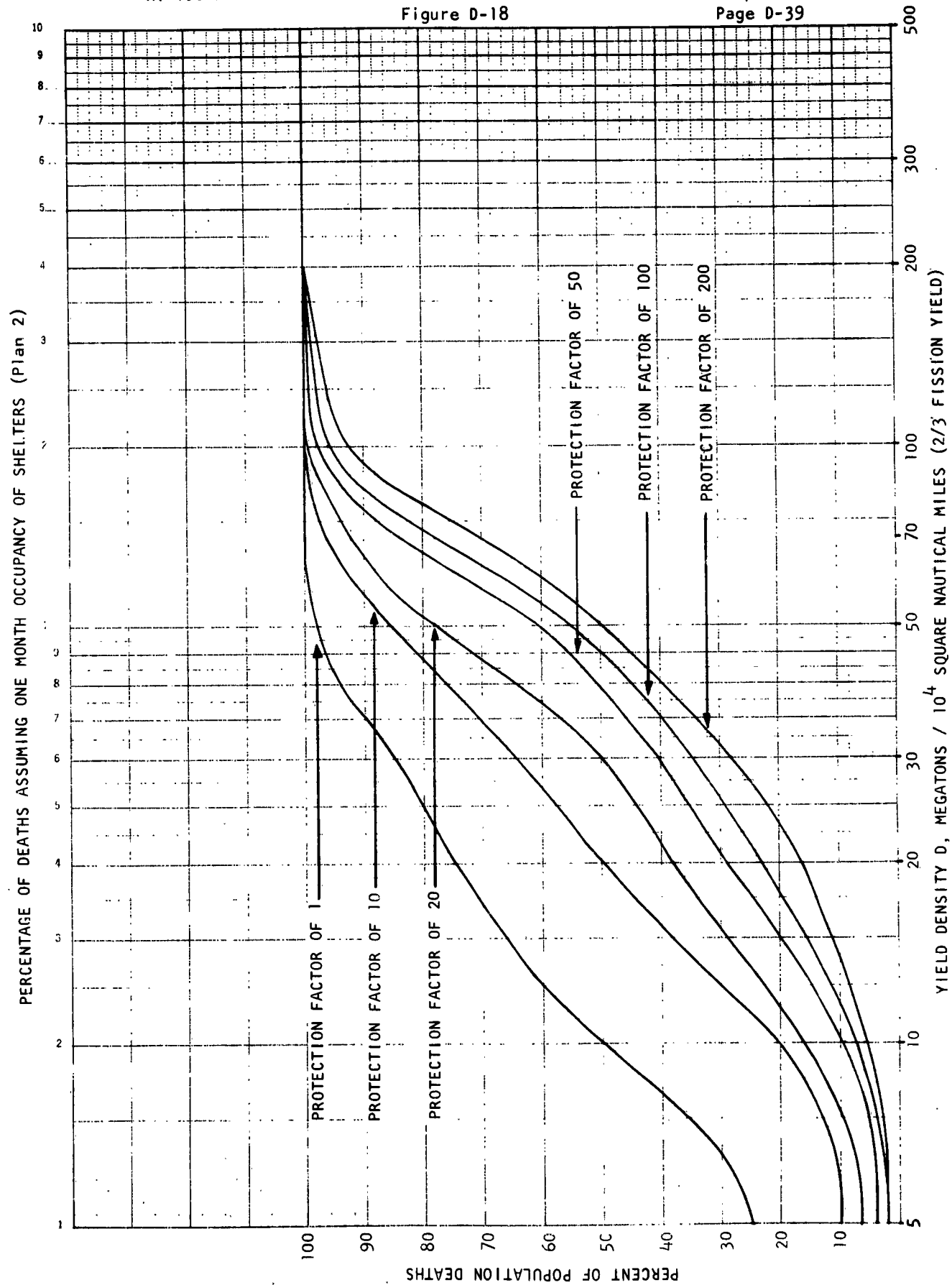


highly dense parts and very thinly populated parts could probably be attacked with greater effect than is shown in this chart. It should be remembered that the population dealt with in this graph is 90 per cent of the total population, the other 10 per cent being in the evacuation area. It is interesting to note that 250 megatons is sufficient to kill 9 to 22 million people or 18 to 40 per cent of the total area population. The delivery of 1,000 megatons against evacuees will kill about 80 per cent of the population. 1,000 megatons is the number of megatons in the Technical Operations Attack discussed earlier. Thus, this graph shows that the evacuation with a protection factor of 20, and two months spent in shelters, is no reply to an adversary attack which ignores military bases and attacks population with that number of megatons.

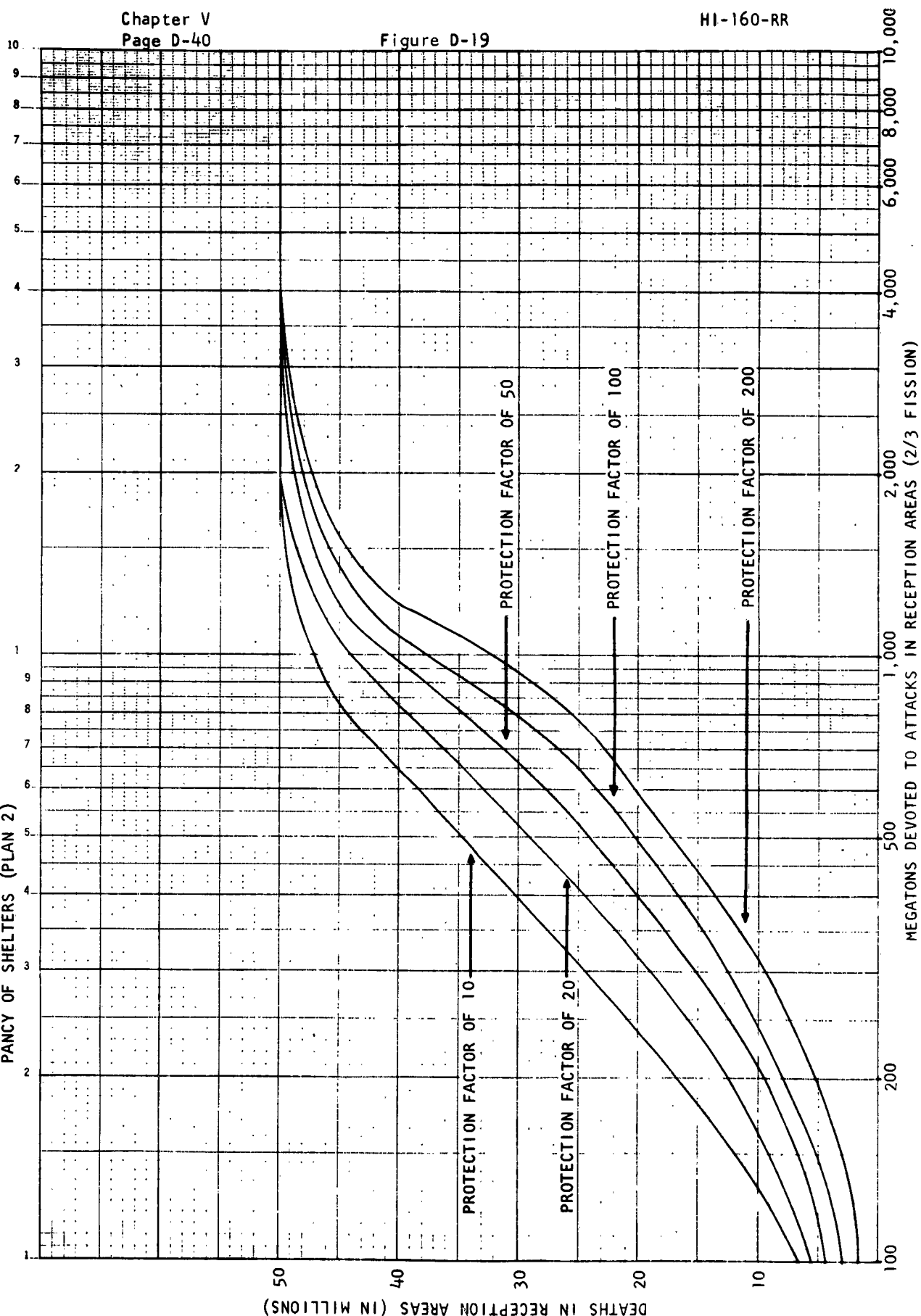
Next, in Graph D-18, we have assumed Plan 2, a period of one month occupancy followed by substantial exit. Plotted on separate curves are the results of protection factors of 1, 10, 20, 50, 100, and 200, and the result of having no protection. The advantages to be gained by the higher protection factors are severely limited by the assumption that exit is permitted after one month. (5) On the other hand, one month occupancy of 25 people in a basement is already a good deal to ask in the context of improvised shelter and improvised preparations. The largest changes again lie in the 10 to 100 megatons per 10,000 square mile range.

In Graph D-19, the results of attacks of varying size are shown with the same assumptions used in Graph D-18 and with megatons distributed according to population density. Because substantial exiting from shelter occurs after one month, the higher factors of protection are not more effective than a procedure of staying in shelters longer and having a protection factor of 20. From the point of view of the total area, 250 megatons kills 15 to 40 per cent of the total population. As pointed out above, this estimate is probably low because the reception areas always have low and high density areas which can be exploited by the attacker.

It is interesting to compare these considerations to the population distribution curves in Figure D-15 and to compute a high estimate. In the one-week evacuation, that Graph shows 32 million people in the most densely populated 50,000 square miles. According to Figure D-18, using attacks against this area of 50 megatons per 10,000 square miles, 50 to 85 per cent mortalities result, destroying from 16 to 27 million people depending upon the protection factors (10-200) assumed. This is from 30 to 50 per cent of the population in the total area. This computation is very imprecise for several reasons and simplifies in not considering the shape and contiguity of the areas which make up the densest areas. However, one can conclude from this upper estimate and the previous lower estimate that 250 megatons devoted to population attacks would kill 15 to 50 per cent of the total population after evacuation. For attacks of this magnitude directed against reception areas, the evacuation discussed becomes of dubious value.



DEATHS RESULTING FROM ATTACKS IN THE RECEPTION AREAS AFTER THE ONE-WEEK EVACUATION
WITH YIELD DENSITIES PROPORTIONAL TO THE POPULATION DENSITIES AND ONE MONTH OCCU-
PANCY OF SHELTERS (PLAN 2)



APPENDIX D-1

DESCRIPTION OF EVACUATION AREAS FOR ONE-WEEK PLAN

<u>Area Number</u>	<u>Area Name</u>
E-1	MASSACHUSETTS, CONNECTICUT, RHODE ISLAND E-1 composed of Mass., R.I., & Conn., except Fairfield County
E-2	PORTSMOUTH, NEW HAMPSHIRE E-2 composed of southern York County
E-3	BANGOR (MAINE) E-3 composed of southwestern Washington County; central Hancock County; southeastern Penobscot County
E-4	PRESQUE ISLE (MAINE) E-4 composed of Presque Isle AFB
E-5	PLATTSBURGH (NEW YORK) E-5 composed of Franklin County; Orleans County; Essex County; northern Coos County (N.H.); north- ern Caledonia County; Lamoille County; northern Chittenden County; Grand Isle; eastern Clinton County
E-6	SYRACUSE-ALBANY (NEW YORK) E-6 composed of Onondaga County; Oneida County; southern Herkimer County; southern Hamilton County; Fulton County; Montgomery County; Sara- toga County; Schenectady County; Albany County; Rensselaer County; Cayuga County; Madison County
E-7	BUFFALO-ROCHESTER (NEW YORK) E-7 composed of Niagara County; Orleans County; Monroe County; Wayne County; Erie County; Gene- see County; Ontario County; Seneca County; Wyo- ming County; Livingston County; Yates County
E-8	ERIE-SHARON (PENNSYLVANIA) E-8 composed of Erie County; Crawford County; Mercer County; Venango County; Clarion County
E-9	PITTSBURGH-ALTOONA-YORK (PENNSYLVANIA) E-9 composed of Lawrence County; Butler County; Armstrong County; Beaver County; Allegheny County; Washington County; Indiana County; Westmoreland

<u>Area Number</u>	<u>Area Name</u>
E-9 (Cont)	County; Fayette County; Somerset County; Bedford County; Fulton County; Cambria County; Blair County; Huntingdon County; Mifflin County; Juniata County; Perry County; Cumberland County; York County; Franklin County; Greene County; Adams County
E-10	SCRANTON-HARRISBURG (PENNSYLVANIA) E-10 composed of Susquehanna County; Wayne County; Pike County; Wyoming County; Lackawanna County; Luzerne County; Monroe County; Carbon County; Schuylkill County; Northampton County; Lehigh County; Berks County; Dauphin County; Lebanon County
E-11	NEW YORK, PHILADELPHIA, NEW JERSEY E-11 composed of New Jersey; Bucks County (Pa.); Montgomery County (Pa.); Delaware County (Pa.); Chester County (Pa.); Philadelphia County (Pa.); northern New Castle County (Del.-incl. Wilmington); Orange County (N.Y.); Westchester County (N.Y.); Rockland County (N.Y.); Fairfield County (Conn.); Putnam County (N.Y.); Lancaster County (Pa.); Bronx County (N.Y.); New York County (N.Y.); Kings County (N.Y.); Queens County (N.Y.); Richmond County (N.Y.); Nassau County (N.Y.); Suffolk County (N.Y.)
E-12	BALTIMORE-WASHINGTON E-12 composed of District of Columbia; western Cecil County (Md.); Harford County (Md.); Baltimore County (Md.); Baltimore (Md.); Ann Arundel County (Md.); Calvert County (Md.); St. Mary's County (Md.); Charles County (Md.); Prince George's County (Md.); Montgomery County (Md.); Howard County (Md.); Fairfax County (Va.)
E-13	DELAWARE-MARYLAND PENINSULA E-13 composed of eastern Cecil County (Md.); Kent County (Md.); Queen Anne's County (Md.); Caroline County (Md.); Talbot County (Md.); Dorchester County (Md.); Wicomico County (Md.); Somerset County (Md.); Worcester County (Md.) Accomac County (Md.); Northampton County (Md.); southern New Castle County (Del.); Kent County (Del.); Sussex County (Del.)

<u>Area Number</u>	<u>Area Name</u>
E-14	NORFOLK (VIRGINIA) E-14 composed of Norfolk; Norfolk County; Princess Anne County; Nansemond County; York County
E-15	RICHMOND (VIRGINIA) E-15 composed of Richmond; Chesterfield County; Henrico County; Prince George County; Dinwiddie County
E-16	MECKLENBURG (VIRGINIA) E-16 composed of Mecklenburg County
E-17	CHARLESTON (WEST VIRGINIA) E-17 composed of Kanawha County; Charleston
E-18	HUNTINGTON (WEST VIRGINIA) E-18 composed of Huntington; Wayne County
E-19	BINGHAMPTON (NEW YORK) E-19 composed of Broome County

FOOTNOTES TO SECTION D

1. These curves were obtained by listing counties in the northeast area according to decreasing density.
2. The assumptions and conclusions are those of the American Chemical Society Committee on Civil Defense. See for example "Non-Military Defense--Chemical and Biological Defenses in Perspective," Advances in Chemistry Series 26, p. 3. The effects of chemical and bacteriological attack against a sheltered, i.e., a clustered, population may be somewhat different.
3. Ibid.
4. The computation does not take into account some newer estimates which predict increases by about a factor of 1.5 in the amount of radioactivity expected in early periods (for example, during the first month) from a given yield. The computations are also conservative in assuming that the fallout is all on the ground in six hours. It has been assumed that 50 per cent of the population will die if they receive 400 Roentgens during the first two months. Like many other computations about fallout effects, the numbers derived should be considered as orientating.
5. However, we continue to ignore radiation after two months and the two effects tend to balance each other. For example, if biological recovery from radiation is ignored, the "200" curve could be interpreted as the result of spending two months in shelter and half of the next four months outside.

Section E. Shelter and Ventilation

Fallout shelters for tens of millions of evacuated citizens, with adequate protection factors for reception areas, can be constructed within a few hours or days, depending on the part of the country in which they are located and the season of the year. Most of the work can be done by evacuees, provided they can be shown how to use available manpower, tools and materials. It must be recognized that such an all-out improvised shelter-making effort can result in billions of dollars of damages to private property. Paper plans appropriate for different sections of the country and designed to help evacuees make improvised multi-family fallout shelters will be described briefly, as will inexpensive preparations that would help assure sufficient ventilation in improvised group shelters.

This discussion rests on two basic assumptions: (1) that an evacuation would not be seen as a mere exercise in brinksmanship; that the people would believe a nuclear attack might really occur within hours or days; and (2) that essentially no shelters have been built in the reception areas before the crisis.

E.1. Protection Factors Desirable and Attainable for Shelters in Reception Areas

The fallout shelters described in this report furnish larger protection factors than do basement shelters often advocated for use in areas as remote from probable targets as the reception areas selected in this report. We will first offer some reasons why, in evacuation situations, it may be desirable to build shelters with these larger protection factors.

It is desirable to minimize the total radiation dose received, especially in view of the high levels of radiation that can prevail for months after an attack of the type and magnitude considered as a possibility for the late sixties in this study. Therefore, we pose the problem of preparations to enable evacuees and local citizens to build shelters capable of reducing the dose received by sheltered evacuees to, at most, 100 roentgens. This choice is partially based upon the observation that small doses can damage healthy adults by shortening the life span. The National Committee on Radiation Protection and Measurement (1) warns: "In experiments on animals, total-or-partial-body irradiation-- brief, divided, or protracted-- is found to shorten the average length of life. Extrapolation to man has led to estimates that each roentgen of total body exposure shortens life from 1 to 10 days,..."

Only a few hours of additional work, in most cases, would be required for evacuees to improve the protection by a factor of 10 for the shelters described herein. This is only a small fraction of the total work time anticipated for a majority of evacuees after they reach their destinations, even for the one-week plan.

Improvised group shelters would not require the economical use of space and materials usual in normal times. Dirt can be piled on living room floors to shield a basement below, lawns dug up for shielding material, or walls torn down for lumber.

The low order of dependability inherent in many specific calculations and assumptions concerning the distribution and intensities of fallout in reception areas needs to be taken into account when planning the shelters and supplies required.

The different estimates of the fallout hazard from even a known attack, and with known wind conditions, is pointed up by a statement in the study of Technical Operations, Inc., entitled The Probable Fallout Threat Over the Continental United States. (2) In this report a comparison is made of fallout estimates derived from several models. One statement notes that: "The most dramatic difference is in the downwind dimensions for the high wind speed... the AFSWP scaled contours giving a value...six times higher for the 1000r contour." This refers to the two-day dose contours. This great difference in the positioning of the 1000-roentgen contour results under some conditions in more than a 20-fold variation in the two-day dose forecast at the same location.

Other examples of extreme differences that result from using different models to predict fallout are cited in the 1957 records of the Holifield Committee. (3)

Small shifts in wind direction can cause large differences in estimated fallout. Even when using the comparatively low two-day doses derived from the Tech Ops' model, a 10-degree change in wind direction in some locations may increase the two-day dose from 900r to 3000r. In some sections of the country, notably a group of states around Texas, mean wind directions in summer at some elevations are the reverse of those in winter. Fortunately, the mean wind directions at the most critical elevations remain generally from west to east throughout the year.

Another reason for planning shelters with higher protection factors than those for distant areas is to be prepared for the lingering radiation dangers from fallout which may be at higher dose rates than are expected. Some current civil defense instruction underestimates the probable long-term dose rate in rural areas. For

example, in June 1962, student instructors at one eastern school were being told that if the initial dose rate is a recorded number of roentgens per hour, then in two days the dose rate will be only 1/100th as high and in two weeks only 1/1000th as high. The erroneous assumption was being made that all the fallout reached the ground one hour after the explosion. But in a reception area far from probable targets, fallout is more likely to arrive six or seven hours after an explosion; accordingly, if the initial dose rate at such a location were 100r/hr., after two days the dose rate would be 10r/hr, not 1r/hr--a factor of 10 difference. Such underestimations of the continuing radiation hazard to be expected in distant survival areas may lead to the building of inadequately designed and provisioned shelters.

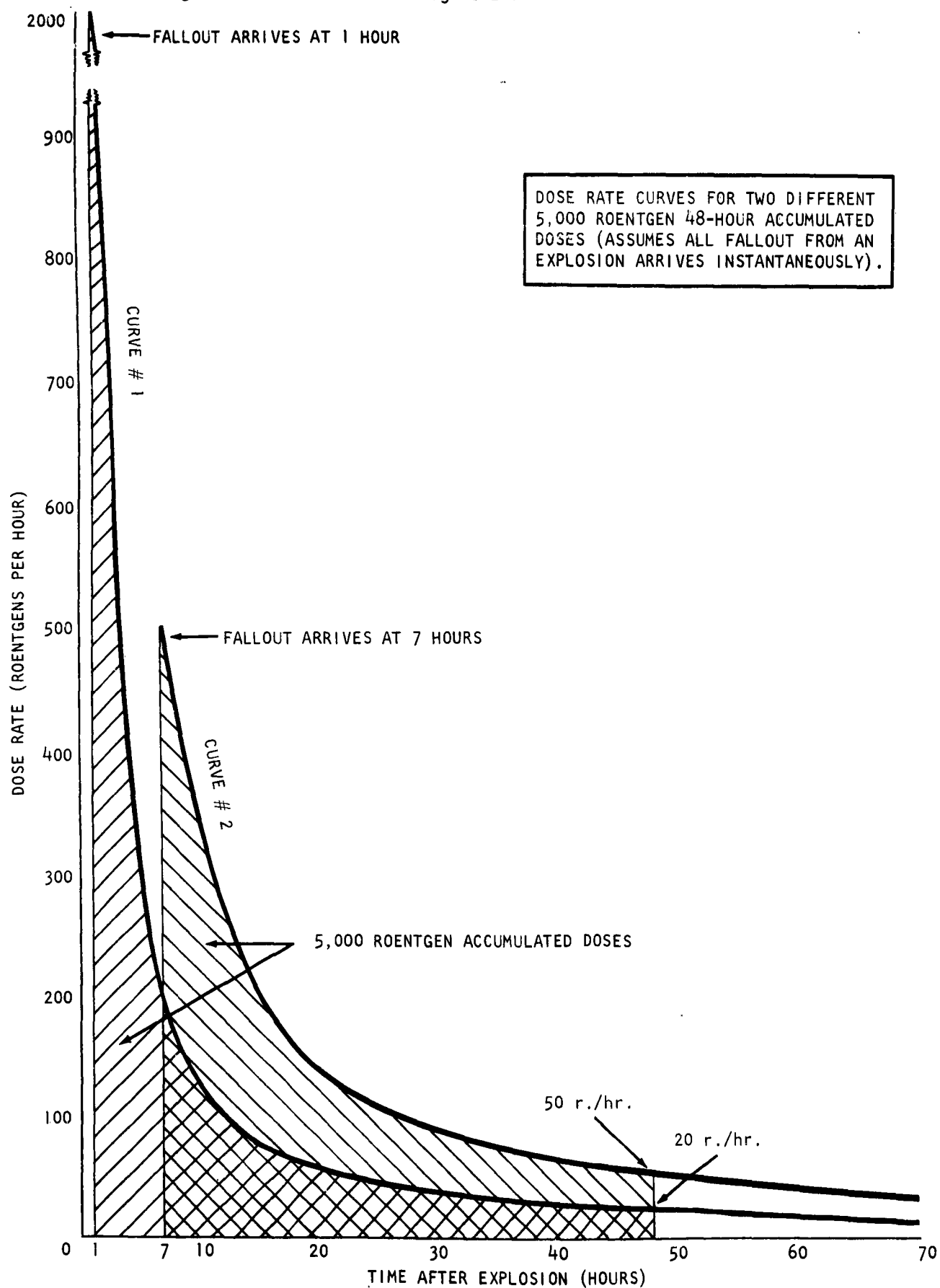
Similarly, the assumption that all fallout will reach the ground one hour after the explosion can lead to overestimates of permissible excursion times from shelters, calculated on the basis of assumed two-day accumulated doses. Also, relying on two-day accumulated doses erroneously calculated in this way to estimate subsequent dose rates may result in a serious underestimation of the danger.

For favorably located reception areas, a basis for a more realistic estimate of permissible excursion times and of the probable fallout hazard following an attack can be gained by considering a more distant location in addition to one where all the fallout reaches the ground one hour after explosions.

Curve #2 of Figure E-1 on page E-4 gives the dose rate curve for fallout that arrives seven hours after the explosion. In the shaded area under curve #2 is shown a 48-hour accumulated dose of 5000r as measured at this location on the ground. This figure also gives a dose rate curve for fallout from a closer explosion that might arrive at this same location would deliver a 48-hour accumulated dose of 5000r.

Although the two 48-hour accumulated doses received from the two explosions are each 5000r, Figure E-1 shows that the fallout received from the more distant explosion would constitute a 150% greater continuing dose rate hazard.

Thus, when using equal two-day accumulated doses, it should be realized that merely by making different assumptions about the distance of a shelter from an explosion the subsequent danger from fallout can constitute widely varying hazards.



One uncertainty in fallout prediction is caused by differences in the fall rates of the fallout particles derived from silicious rocks in comparison to those of the lighter, ash-like fallout particles derived from carbonaceous rocks such as limestones. Carbonaceous fallout particles tend to travel farther before reaching the ground. Since an estimated fifth of the United States has carbonaceous rocks within a few feet of the surface, especially in some of our western missile base areas, the common assumption of silicious fallout particles resulting from nuclear ground bursts in the United States may sometimes be in error.

The Effects of Nuclear Weapons ⁽⁴⁾ gives a classic illustration of the dangers of a wind shift and of the possible persistence of radiation over a period of weeks in remote areas. This data comes from the record of the radiation at the northern end of Rongelap Atoll in the Marshall Islands after the 1954 test of a 15-megaton ground burst weapon. This area, located 100 miles from ground zero, received 2150 roentgens in the first 36 hours, another 1310 roentgens within the week, and in the succeeding period from one week to one month, an additional 950 roentgens. The planned explosion was supposed to avoid contaminating this area. At H + 25 days, after rains and wind had started the weathering process, measured dose rates were found to be about 40% below calculated rates. This indicates that the actual dose to an unsheltered person during the 21-day period (one week to one month) could have been more than 600 roentgens. ⁽⁵⁾

Geometrically calculated protection factors may not be very reliable when used to calculate the dose for occupants of improvised shelters. For the sake of uniformity and simplicity in protection factor calculations, the assumption is often made ⁽⁶⁾ that no significant amounts of fallout enter the structure. The validity of this assumption can be questioned since normal winds increase the likelihood of fallout entering improvised structures. Also the possibility exists that concentrated massive nuclear attacks can release enough energy to cause moderate yet significant winds to blow over areas a hundred miles or more in diameter. ⁽⁷⁾

Additional reasons for advocating higher protection factors include (a) the possibility that ventilating air (when filters are absent or inadequate) will bring some fallout into the shelters and (b) that a non-uniform distribution of fallout particles can increase the radiation threat substantially.

Because it seems desirable in the face of many uncertainties to introduce safety into the chosen protection factors, those in this section will be roughly twice those calculated on the usual geometrical basis.

The RAND Corporation's estimate of the country-wide fallout to be expected from a 5,400-megaton fission (8100 total megaton) attack on this country results in 35% of the U.S. being covered with fallout having a reference dose rate of more than 4000r per hour at one hour.

This indicates that two weeks after this RAND attack, the dose rate over 35% of the United States would be at least 4r per hour, making it highly desirable for a large part of the population to remain under shelter for considerably longer than the following two weeks.

A minimum protection factor of 200 or more for improvised shelters is desirable to make it practical for people to live in them almost continuously for a month. Makeshift, small, sit-down shelters, such as those made by propping doors against a wall or by covering tables with a few inches of earth, should not and need not be considered if there is a day or more to build shelters. During a one-week evacuation able-bodied evacuees, given proper instructions, should be able to construct shelters with protection factors of at least 200 in from 8 to 32 hours. This will be elaborated upon, starting on page E-11.

E.2. Ventilation of Shelters

Adequate ventilation of the shelters for evacuees is required. If 30 evacuees are to be accommodated in a basement fallout shelter instead of the normal 5 occupants of the home, they would need at least 6 times as much air for breathing and cooling purposes. This becomes especially important during hot, humid times of the year. With 30 people staying several days or more, the heat-absorbing properties of an average basement are insufficient.

Generally, in order to make an emergency home basement shelter for 30 people, it is necessary to pile earth on the floor above for shielding. The number of square feet of surface in the shelter per person through which body heat can be transferred is cut to 1/6th. Thus the dissipation of body heat to walls, floor and ceiling, that in a home basement could be satisfactory for five people, often becomes inadequate for 30. Assuming typical reception area shelters furnish only about 70 cubic feet of space per person, the necessity of forced ventilation is emphasized by this OCD statement:

For rough estimating, each shelter occupant should be allowed at least 500 cubic feet, where no mechanical ventilation is available. This would permit occupancy for about a day before conditions become intolerable. (6)

The requirements for enough cooling air for crowded underground shelters occupied continuously for days can be as high as 15 to 25 cubic feet per minute per person in hot-humid weather. Therefore, shelter plans should make provision for ventilating pumps, or at least supply evacuees with instructions on how to make their own air pumps quickly with local materials, such as plastic films, coated fabrics, canvas, or painted fabrics. At least three types of simple, cheap ventilating pumps, recently invented, deserve evaluation. The first is a bag pump--merely a big impermeable bag (that can be made for as little as two dollars) with a stick handle, an exhaust opening, and a simple means of suspension. With a home-made bag pump, one occupant of a basement group shelter can force enough air through the shelter--over 300 cfm if the intake and exhaust openings are about one square foot in cross-sectional area--to meet the requirements of up to fifty occupants in cool weather, or up to thirty in hot dry weather--but perhaps only about a dozen in very hot-humid weather, if the earth surrounding the shelter is hot and dry.

Another simple and inexpensive suggestion for ventilation, useful especially during the hours when fallout is descending and tends to enter with air from the outside, is the use of lung pumps. Lung pumps consist of a system of tubes (garden hose and ducts made of light plastic film and scotch tape will serve) and check valves (suitable small curtain-and-screen valves are promising and can be home-made in a few minutes) enabling people in a shelter to exhale into tubes that lead outside. An equal amount of fresh air will enter into the shelter to replace that exhausted.

A third type of manually operated new pump, that uses the recently invented curtain-and-screen valves in conjunction with a large plastic diaphragm attached to the ceiling, gives promise of furnishing efficiently the large volumes of air needed to cool shelter occupants, even during hot-humid weather. The mechanical efficiency of this new pump may be higher (and the cost much lower) than many presently-used hand-cranked blowers.

Simple, inexpensive ventilating pumps which can be made rapidly from paper instructions need further development and testing. These can, if proven adequate, provide the basis for OCD plans for emergency ventilation systems to be used in conjunction with improvised shelter during possible future crises.

E.3. An Inexpensive Improvised Shelter for Construction
During a One-Week Evacuation Program

... This illustrative plan makes three assumptions: (a) mass education is effective during a crisis involving evacuation; (b) strong incentives for the citizens in the reception areas are available to induce them to help provide for evacuees; and (c) survival supplies such as austere rations, water containers, and ventilating devices or information have been pre-stocked in the reception areas.

E.3.1. Mass Education

Dr. Paul H. Johnstone, of the Weapons Systems Evaluation Group, in his lecture delivered on May 1, 1957, before the Industrial College of the Armed Forces, stated:

You frequently hear talk about panic. Panic in the true sense, according to all the best observation, is quite rare. Most people tend to do those things which amount to a rational response to the threat of danger as they understand that threat, and that is your key. If they are in a position to understand, and if their knowledge is such that they understand what the events and the threats are, to a very large extent they will act rationally.

Making the assumption that if an evacuation has been ordered, there will be a great motivation to learn about survival⁽⁸⁾, the following advance preparations can be undertaken for educating the evacuees and local residents of the reception areas:

- 1) Maintain a stockpile of instructions for the post office, newspapers, and/or radio stations to disseminate at appropriate intervals. These instructions may relate to shelter construction, ventilation, local and state food stockpiles, water containers, radiation monitoring, local authority, emergency communication, effects of nuclear explosions--especially fallout particles and associated radiation, government responsibilities, and assisting the evacuation effort.
- 2) Maintain a stockpile of instructions to higher levels of authority such as Civil Defense officials, police, firemen, local town and county officials, and possibly army or national guard officers in the event that martial law is declared. These should be educational both in providing basic information and in spelling out a useful role for assisting the emergency plan.

Shelter construction information should emphasize the importance of getting adequate thickness of shielding. Few citizens now realize that 33 inches of earth gives 32 times as much shielding protection as half of that much cover (although 6.6 inches gives only 2 times as much protection as 3.3 inches). Adults can be taught in a few minutes that each additional 3.3-inch layer of earth cuts in half the radiation able to pierce a shielding cover of earth. Citizens should be told how they can use local materials to solve their construction problems. For example, if they cannot achieve a full three-foot shielding of earth, protection against fallout can be obtained by covering the house roof with a smooth material such as plastic film or metal sheeting. Or if fire danger is considered slight due to the remoteness of the shelter from the probable target areas, rugs, canvas, bed sheets, or blankets placed on the roof of a shelter will facilitate later decontamination; these coverings can easily be stripped off after they have collected fallout particles. Thus the subsequent danger can be reduced appreciably. One way to deal with fallout coming to rest in places where it would be particularly harmful is to rip off the eaves of roofs.

Evacuees who are preparing to evacuate by car can be urged to bring food supplies with them; suitable clothing, i.e. work clothes, raincoats, heavy shoes and overshoes; tools such as a shovel, pick, ax, gloves, knives, flashlights and batteries, transistor radio, pliers, plastic sheeting, coated fabrics and canvas; at least a few quarts of water in cans, bottles, or bags; water purification tablets; first-aid kit; infant-care supplies; and civil defense instruction literature.

If digging tools are available, shelter occupants can often continue to increase their effective shielding after the arrival of fallout makes it impossible to leave their shelter. Digging a slit trench in the middle of the basement floor, if the householders are sure that it is above the groundwater table, not only can supply shielding earth to put on top of tables for extra protection, but the trench itself can furnish radiation protection.

Where time is available, citizens who evacuate should be urged to obtain and take along concentrated foods such as canned meats, sugar, candy, shelled nuts, dense crackers, and milk powder.

E.3.2. Incentives to Inhabitants of Reception Areas

Strong incentives to encourage cooperation of local citizens in the reception areas should be carefully formulated in local plans for use during an evacuation. Copies of these plans should be held in appropriate distribution centers.

Some rural and small-town Americans can be expected to resent or even to resist the arrival of "hordes of urban evacuees." This attitude must be overcome if the construction of effective shelters is to be facilitated by local inhabitants. Farmers with their machines and know-how would be especially important. The problem is to persuade them to begin work as soon as an evacuation is ordered for those who are scheduled to arrive hours or days later. Pre-crisis planning should, where feasible, strive to let each householder know approximately how many people (plus or minus about 10% to avoid splitting families) he must get ready to shelter in his home, before they actually arrive. Local people should feel that they will not be overwhelmed, that the evacuation is well-planned.

Specific incentives to natives of reception areas could include either liberal payments at hourly rates for machines and labor effective in shelter building and improvement, or perhaps by the square foot of shelter space produced, with minimum thicknesses of earth shielding. Similarly, incentives could be offered for cutting and hauling trees either for basement ceiling props or for roofing for underground shelters.

It will be important to assure local inhabitants of compensation for damages and costs of a strategic evacuation and for supplying and sheltering evacuees.

E.3.3 Comparisons of Times to Improvise Special Shelters with Large Protection Factors

E.3.3.1 Northeastern Reception Areas

In the N.E. United States, the time required to improve average basements sufficiently to obtain a protection factor of 200 or more will tend to vary greatly with the season of the year. In the Northeast, where 93% of the population have ready access to dwelling basements, evacuees can improvise basement group shelters.

Consider the time required to get a protection factor of at least 200 when the ground is not frozen, and assume that a house normally having 5 occupants would shelter 30. One way of converting a basement to a good fallout shelter--assuming that evacuees can count on at least 8 hours to work--before an attack--would involve the following steps:

- a. Clear the floor directly above the basement of all furniture and rugs.
- b. Start shoring-up the basement ceiling. It must be supported to hold the necessary weight of earth shielding. Tree trunks of three 2" X 6"s nailed together can be used to support a basement ceiling. Simple tools--an ax, a saw and a hammer--will suffice for this work.
- c. While trees are being cut and/or heavy lumber is being pulled out of nearby garages and sheds for vertical columns, the evacuees can be digging up earth, carrying it into the house to cover the floor above the basement. Assuming that the average basement (conservatively) has 400 square feet of floor space, if 20 out of the 30 people allocated to this house will carry earth, each need carry about 33 cubic feet in order to build up a layer of 16 inches deep. At 120 pounds per cubic foot, this would average 3960 pounds of earth per person. This means carrying 132 - 30-pound loads. Thirty pound loads can be carried in a dishpan, a small bucket, or a gunny sack. Working in a cool climate, one load every three minutes is easily maintained. Thus within 8 hours, the basement could have a protection factor of at least 200.

Average citizens engaged in this kind of emergency construction will need practical, detailed instructions. Otherwise inexperienced people are likely to court disaster. Some might mistakenly think, for example, that three separate 2" X 6" columns will support a basement ceiling as well as one 6" X 6" timber.

Bulldozers (or farm tractors with plows) can be used to greatly speed up the work of getting enough earth for shielding since digging up hard earth is more work than loading and lugging loosened earth.

Secondly, the time required to give this same basement a protection factor of 200 would probably have to be increased from about 8 hours to several days during the time of the year when the ground is frozen. It might be necessary to tear down numerous structures for fuel to thaw patches of ground close to the homes whose basements were being improvised as shelters. If the ground were frozen

a couple of feet deep, slow fires would have to be kept burning for about 24 hours to thaw sufficiently for digging. Also, many evacuees would probably be handicapped by a lack of proper clothing and boots for sustained outside work in freezing weather. Furthermore, outdoor work in really cold weather is demoralizing. Average citizens would find it difficult if not impossible to achieve protective factors of 50 to 200 in their shelters, if they should have to thaw ground to get shielding material.

As an alternative, a layer of ice about 36 inches thick can furnish as much shielding as 16 inches of earth. When the ground is frozen the use of ice may be the quickest way to secure adequate shielding in cold weather. By spraying water on a snow surface and distributing the spray over a large enough area, a sheet of ice 4 to 6 inches thick can be frozen in a few hours during cold weather. This can be chopped into pieces, and then carried into the house, in place of earth. Windows might be left open, and covers (rugs, canvas, or wet sheets would do) placed over the top of the ice to keep fallout particles from dropping through cracks in the ice.

Larger group efforts, making use of carefully planned ground-thawing combined with the use of large bulldozers, offers a better hope to those fortunate enough to have the equipment available. Finally the possibility of digging with explosives should be mentioned as a possible separate study. This technique could be especially desirable during early spring months when the ground may be too frozen to dig but the weather too warm to make ice.

The above suggestion for shelter construction should not be viewed with optimism. On the contrary, the difficulties of improvising adequate emergency fallout protection when the ground is frozen suggests the need for alternative construction techniques, or in lieu of these or adequate preparations, alternatives to strategic evacuations during the winter months.

E.3.3.2 Houston Reception Areas

To appreciate the very different problems evacuations pose in different parts of the United States, consider a part of the country where very few basements will be available in reception areas. For example, around Houston, Texas, it is much more difficult to improvise shelters with high protection factors than in the N.E. Near Houston less than 11% of the population have ready access to dwelling basements. (9)

Furthermore, near Houston there are practically no mines or existing good shelters. In addition, average annual air temperature is 65 to 75 degrees, compared to the N.E. reception areas which have average annual temperatures of 40 to 50 degrees. Another factor in the problem of cooling is the fact that soil temperatures several feet below the surface average nearly 70°, about 20° higher than that in the N.E.

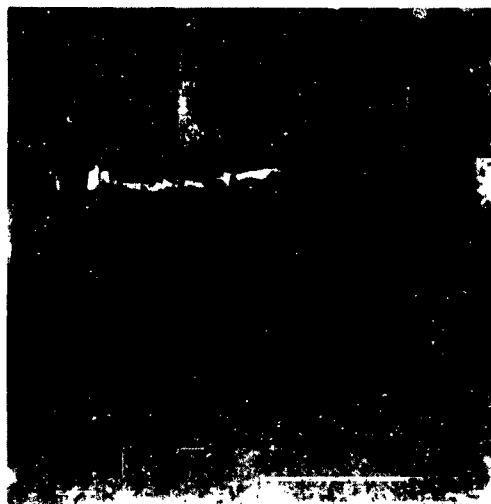
An estimated 24 hours will be required for an average group of evacuees to construct fallout shelters with a protection factor of between 10 and 20 within a lightly constructed, one-story frame house typical in the Houston evacuation areas. It is assumed that an average of 20 people, (four times normal) will occupy a shelter, and that protective factors of 200 or more are attempted.

If the water table is four feet or more below the surface, as is usually the case, then a quick way to get a protective factor of 10, while building shelters than can be progressively improved to give protective factors of 200 or more, is to cut holes in the floor so that, staying clear of the foundations, evacuees can dig 3 feet wide, basement-like sub-floor trenches perpendicular to the floor joists. The bottom of the trenches should be about 4 feet below the bottom of the floor joists.

After blocking up the floor joists adjacent to the trench, dirt should be piled along the sides of the trench to fill the space between the ground and the underside of the floor, except for some air inlets. Since few people are physically able to work efficiently under these conditions for more than a few minutes at a stretch, a few digging tools would be enough for 20 people in excavating the trenches. Those not digging could pile earth for shielding on the floor above the trenches. The illustrations E.1 on page E-14 show this type of sub-floor shelter, made by two seventeen year old boys who required 5 hours for the work below-floor. The trench shown provides space for four people.

Provided they can keep themselves cool enough, people can survive, with 6 square feet of trench per person (West German two-week shelter tests have supplied only 5 square feet of floor space per occupant), plus the part-time use of 2' x 6' sleeping spaces dug as a shelf along one side of the trench. For this type of improvised sub-floor shelter, the excavation required per person is about 20 cubic feet or 2400 lbs. At 10 lbs. per shovelfull, about 240 shovelfull. At 3 shovelfull per minute, 50 minutes per hour; this is 1,500 lbs. per hour. Thus, to move 2,400 lbs. of earth, about 1.6 hours would be required. For 20 people to be sheltered--with only 3 people continuously digging, and interruptions for

PHOTO ILLUSTRATIONS E.1



Sub-floor shelter, furnishing 6 sq. ft. floor space for each of 4 persons, plus a side sleeping shelf. End is left open for illustrative purpose.



Two seventeen-year old boys shored up floor joists and dug this 4-man shelter in 5 hours. The horizontal board on the right side holds side-shielding, piled earth 2 to 3 feet wide.



Trench shelter, 6'x3'x5' deep, dug in hard alluvial soil by two high school students in 6 hours, including time to roof and cover with 2 ft. of earth. Note that as an experiment only 2 pieces of barb wire were used, secured by 'dead men,' with wire slack one ft. below surface.



Abnormally large sticks were laid across the supporting wires, because only 2 wires were used. Sage on top of sticks holds 2 feet of earth. Opening was left as shown for illustrative purposes.

cutting floor, blocking up joists, etc.--about 24 hours would be required to produce a shelter with a protective factor of 20. Subsequently it might be desirable to dig a few pits in the bottom of the trenches for standing room.

Most of the earth excavated from the trenches under the floor will be needed as shielding for the side spaces around the trenches, under the floor. Earth outside the house can cover the floor above the trenches. Within the 24 hour construction period, 10 inches of earth piled on the floor would give a protection factor in the trench below of about 20.

If an additional 12 inches of soil is piled on the floor, the protective factor would be increased to about 200. Approximately 7 hours is estimated for this additional work. Even children could contribute some work. If available, tractors with plows could greatly reduce the digging labor.

During much of the year in hot humid areas of south Texas, the problem of keeping the shelter occupants cool enough to survive for a few days may prove more difficult than the other aspects of constructing shelters, unless special ventilating systems are perfected, produced, and stored in advance. As much as 30 cubic feet per minute per shelter occupant may be required during very hot, humid weather. Bag pumps cannot meet the requirements. The manually operated ventilating pump described in Section E.2 gives promise of being adequate at a cost of about one dollar per shelter occupant.

During a possible crisis the problem of water is also more difficult than in cooler climates. In Army Engineer shelter tests in Arizona, men drank one gallon per man per day, and only urinated one pint. The stockpiling of plastic bags for water containers deserves serious consideration.

In the following Appendix other types of group shelters that evacuees can improvise within a few hours to days are described, some furnishing incidental protection against fire and blast effects, in contrast to basement and sub-floor shelters. Also improvised home shelters appropriate to areas near Tucson and Los Angeles are briefly described. Also, some preliminary estimates of costs for five different levels of strategic evacuation preparations are outlined.

APPENDICES TO SECTION E

Additional estimates of times required for urban evacuees to improvise shelters; additional comparisons of differences in shelter and ventilation requirements for urban evacuations in various parts of the United States; and some preliminary cost estimates for different levels of strategic evacuation preparations.

Appendix E-1

An Improvised Shelter With Some Blast and Fire Protection

Serviceable underground shelters with 5-10 psi blast protection can be made in three or four days in parts of the country where timber is available. The help of heavy earth-moving equipment is desirable but not required. In a few days with ordinary hand tools men can make an underground shelter with 8 square feet of floor space per occupant, and $6\frac{1}{2}$ feet headroom.

Big, covered trenches can be dug in terrains where rock is more than 5 or 6 feet below the surface and where the water table is not too near the surface, or where gravity drainage can be secured. The best areas are typically wooded and are found east of the Great Plains, in the Rocky Mountains and in the Pacific Northwest. Surveys need to be made to determine the regions suitable for such shelters.

Underground log fallout shelters have already been successfully constructed in desert valleys in the West, where untreated wooden structures will last for decades. The construction of a simpler version can be visualized as follows:

Assume 80 people desire to build this type of shelter with 3 feet of earth covering as rapidly as possible.

If they can cut and haul shelter roof logs, 6 to 12 inches in diameter, and 10 to 12 feet in length, they should plan to dig a trench 6 feet wide, 7 feet deep, and 100 feet long. This means an excavation of 4,200 cubic feet of earth, which with right-angle entrances at both ends, comes to about 4,500 cubic feet, or 540,000 pounds. If 60 of the 80 people can work, the average worker must carry 9,000 pounds out of the trench.

Most of the plowing can be done by a single tractor and plow, while men with picks and bars work along the sides of the trench. Improvisations, such as sleds or scoops pulled by a tractor or car, might be suggested in instructions for easier earth removal. The work required to remove 9,000 lbs. of earth (lifting, shovelling, or passing containers in bucket-brigade fashion) will be about 45,000 foot pounds. This should be possible for the average man in a full day's work without special labor-saving techniques.

The problem of collecting about 150 logs averaging 10 feet long and 9 inches in diameter, to cover the trench and entrances, is not difficult in timbered country, provided the help of a few experienced men, skilled with ax or chain saw is available. A small farm truck can haul these logs in about four loads. Four or five additional loads of tree tops, branches and boards and several hundred feet of wire (easily obtained from fences in most areas) will be required.

With the help of two or three properly skilled and equipped men, this material can readily be gathered in a day.

A third day should suffice to lay the 10 foot roofing logs, side by side, across the trench, and to set vertical, lighter poles and branches close to the trench banks, with their tops wired and/or notched so as to be securely connected to the roofing logs, and their lower ends set apart and braced with horizontal poles laid on the bottom of the trench. Behind the vertical poles, evacuees should place horizontal poles, limbs and boards to keep the vertical earth banks from subsequently caving in. Even small children can then help chink the log roof with sticks, sacks, roofing, carpets, almost anything, preparatory to piling on shielding earth.

In high rainfall areas with variable water tables, the 100-foot-long trench should be "floored" roughly with limbs, to permit drainage while keeping occupants' feet out of the water. But this work, and the building of rough bunks along one wall out of poles and boards should be left until after 3 feet of earth has been piled on the roof, which will require another 6 hours work--and much less if a tractor with a blade is available. Except in very sandy areas, properly domed earthen roofs can be made leak-proof by tamping the earth as it is piled on, and by finishing it with smooth, sloping surfaces. Thus in about three or four days, evacuees could make far more secure shelters than by improving parts of existing houses, provided they have the help of some local people and simple farm machines.

In warm weather some type of forced ventilation, at least bag pumps, will be needed to survive for several days or weeks. In hot weather, more efficient air pumps, possibly two 800 cfm, manually-operated, flexible-diaphragm suction pumps, or a sufficient number of rotary blowers can be used.

Most fallout particles should be removed from the air that must be pumped through group shelters. Possible means of removal include some types of simple, low-resistance filters, and covered gravity-settling pits. No firm recommendations are possible until realistic field tests of the equipment produce reliable facts. But a large earth-covered pit made so that a pump can draw air from the top of this pit, while outside air can enter only near its bottom, is a promising lead. Also the practicality of using foliage as a dust filter in such a pit should be investigated.

Appendix E-2

Tucson Evacuation Areas

Desert reception areas and target cities will have their special problems during a strategic evacuation. Since Tucson, Arizona is literally ringed by hardened Titan installations, its population may need be evacuated before an imminent nuclear attack. A pre-attack evacuation should be planned to move upwind from Tucson, this would be westward into rough desert country with few roads, little water, and very little food unless evacuees reached the Gila River Valley--a logical reception area for the city of Phoenix.

For evacuees travelling more than 80 miles westward from Tucson, a major requirement will be an adequate quantity of drinking water. Cheap plastic water bags, provided before the evacuation, would increase the practicality of most shelters and potential shelterbuilding sites. In the reception area 100 miles west of Tucson, where moderate amounts of fallout would generally be expected, providing adequate radiation protection should be no more difficult than the problems of water, ventilation, and food during the shelter period. Without advance preparation, improvising a satisfactory ventilating pump for a shelter could prove more difficult than the shielding problem.

A trench, that can be dug in desert soils, with a car parked over it, and with earth piled into and around the car, requires only a few hours for the average family using pick and shovel. However, to immobilize or wreck the family car in the desert may not be a desirable solution, if a possible attack is believed unlikely for at least several days.

In open deserts and grasslands, there are usually insufficient materials for constructing improvised shelters, except for the possibilities of using unorthodox methods. One such possibility is to use wire, obtained from local fences to support the heavy roof. See page E-14 for two photo illustrations. These roof-supporting wires are run perpendicular to a 3-foot-wide shelter trench, and held by horizontal "dead men" (buried stakes or posts). The wires, spaced about one foot apart if ordinary barbed wire is used, are long enough to form slack loops curving a foot below the surface. These suspension-bridge-like loops of wire can support fence posts, brush, cactus, seats from cars, etc. and can be made dirt-tight with a covering of seat covers, blankets or grass. Then 3 feet of earth piled on this wire-supported roof can provide a protection factor up to 1000, which is more than can be obtained with the same amount of earth piled onto and around a car parked over a trench.

Appendix E-3

Improvised Shelters for Los Angeles Reception Areas

Reception areas for Los Angeles metropolitan citizens are assumed to lie mostly along the coast, north of the city, since the high-altitude winds are usually from the west. Plans for improvised shelter during Desperate or Crash evacuations could include the method, previously described for Houston (see section E.3.2), of utilizing dwellings without basements to make shelters for 5 to 8 times the normal number of occupants of a house. Because of the relative scarcity of homes in the reception areas north of Los Angeles, evacuees would face the problems connected with making unorthodox shelters. During part of the year ventilation for underground shelters may be required although less critically than in the more humid Houston area, or the hotter Tucson area. If the extensive water system of southern California were wrecked, and electric power for the well pumps cut off, then water needs, without prior storage, could prove disastrous during the period of shelter occupancy. Polyethylene water storage bags may provide a solution to this problem.

Before a crisis, citizens outside the Los Angeles metropolitan area, assuming no nearby military targets exist, may choose to prepare shelters having good fallout and some blast protection as an alternative to a difficult strategic evacuation. Ingenuity and experimentation can often reduce the cost of making good shelters. For example, the city of Downey, in the southern outskirts of Los Angeles, has made a study of means for quickly converting their

storm drains into group shelters. By using large inflatable rubber seals to divide these storm drains, an estimated cost of \$51 per person provides water, ventilation and shelter spaces for 24,663 persons, 28% of the Downey population.

Full use might be planned for all available seaworthy ships and boats. Those who could take to sea in time, would have good prospects of surviving, provided there was sufficient water and fuel to reach ports in Mexico, or Canada. Once again, the need for an adequate supply of drinking water appears as an essential of evacuation planning.

Appendix E-4

Use of Mines as Shelters

The shelter posture in this study does not include the use of mines. Nevertheless some mines may play an important role in strategic evacuations where the time needed to reach and prepare them is available. The use of these mines assumes a higher degree of preparation than we have considered for our one-week plan. In this study we tried to get evacuees ready to move into improved basement shelters in the event of an attack. The special problems of stocking, ventilating and equipping mines for shelter are beyond the main purpose of providing a preliminary feasibility study.

In any case, with proper preparations some mines would undoubtedly furnish very suitable shelter space. For the most part, limestone, lead, zinc, salt, potash and gypsum mines are more suitable than those worked for precious metal, since profitable mining of the inexpensive ores usually results in wide excavations dug deeply into stable formations, with many substantial interior supporting columns. By contrast, coal and precious metal mines often have deep shafts and narrow, winding low passageways unsuitable for habitation. Furthermore, such mines often present serious difficulties regarding access, ingress, water disposal, and ventilation.

Some mine space available in the northeast area is discussed in Shelter From Fallout.⁽¹⁰⁾ This study estimates that there are 122,000,000 square feet of suitable limestone mines in Pennsylvania, mostly around Pittsburgh. At 10 square feet per person, these mines could hold 12 million people. In salt mines, principally near Buffalo, there is space for 5 million people. In the northeast part of West Virginia there are limestone caves with 13,500,000 square feet of suitable space.

The temperature in such mines is within a few degrees of 50 degrees in all cases, which makes them desirable as underground shelters. However, crowded underground shelters, even in winter, become overheated within a few days and require a ventilation system for cooling. Thus mines would generally require large ventilating systems to transform them into habitable shelters on the scale contemplated.

Appendix E-5

Ways to Increase Radiation Protection of
Basements in Extreme Emergencies

Assuming that evacuees are caught by an unexpectedly early attack just after having reached a home in a reception area with an unimproved basement, and that they expect fallout to arrive within two hours, they can improve this basement's protection by the following action:

- a. Piling books, dense objects of all kinds, furniture etc. on the floor directly above the basement, especially over the best shielded corners of the basement.
- b. Pile earth to cover basement windows, and, if time permits, shovel earth against the sides of any parts of the outside basement walls that are above ground level.
- c. Take large tables, plus doors from inner rooms and closets, into the basement, in order to increase sleeping space. If the evacuees occupy in two layers (on and under makeshift tables) in the best shielded corners and sides of the basement, they can often cut radiation received to less than half that from using the basement in an unplanned fashion. The average radiation dose absorbed by any one shelter occupant can be reduced by at least 25% by the mutual body shielding--if occupants maintain two layers lying as closely packed together as did Mao Tse Tung and his roommates while sleeping in their student room in Peking. Chinese can sleep on a floor, while lying on their sides so tightly packed that one cannot roll over to change sides unless all the sleepers roll over. Perhaps Americans can also during a short period of dire peril from fallout.

Appendix E-6

Preliminary Estimates of Pre-Crisis Costs For
5 Levels of Shelter and Ventilation Preparations
For Strategic Evacuation of the N.E. United States

The following rough estimates are indicative of the costs of five levels of preparations, as regards shelter and ventilation only, for evacuating the 46,000,000 urban citizens out of the total population of 54,000,000 in the Northeast. These costs largely represent initial, non-recurring expenses, to be made within a year or two. Annual expenses to maintain these levels of preparations as regards shelter and ventilation should not amount to more than about 10% to 15% of these initial costs.

1. Paper Plans Only (\$15 million)

- a. R & D projects: (1) practical techniques for rapidly converting, basements into group fallout shelters; (2) techniques for strengthening basement shelters to withstand a few pounds overpressure; (3) methods of making log-bunkers and other types of underground fire and blast resistant shelters; (4) ways to transport farm machinery and earth-moving equipment into potential reception areas; (5) efficient use of such equipment for shelter construction, (\$2 million)
- b. Print and distribute descriptive booklets plus releases for local newspapers, radio and TV stations, to be stored locally, for use in time of extreme crisis, (\$5 million)
- c. Develop effective emergency shelter ventilation pumps of the do-it-yourself types that can be made by evacuees within a few days using local materials and skills, (\$200,000)
- d. Make preliminary surveys and plans of existing structures in reception areas, especially of homes with basements, suitable for rapid improvement into good shelters for groups of urban evacuees, in addition to present inhabitants. Include a rough survey in reception areas of existing hand tools, plus earth-moving machines. Plan the number of evacuees to be routed into all sub-areas of reception areas, (\$8 million).

2. Paper Plans Plus Inexpensive Preparations (\$61 million)

Same as 1 above, plus stockpiling hand tools: \$23 million for one shovel, pick, and ax for each of approximately 2,400,000 home basements in the Northeast reception areas. Also \$3 million for stockpiling a cheap emergency ventilating pump for each basement group shelter--probably a bag pump at about \$1.00 each. Shelters for essential radio and power station operating personnel, and CD command posts: \$20 million.

3. Paper Plans Plus Modest Preparations (\$100 million)

Same as 2 above, except the cheapest possible ventilating pump would be replaced by a more efficient air pump, \$10 million additional. Distribute shelter-making and ventilating equipment to individual home owners with suitable basements, \$5 million. Buying and distributing four stout ceiling props (logs, such as are used for mine props), at \$2.00 each, to 2.4 million home basement shelters, \$19 million. Stockpile a means for furnishing a little dependable lighting for shelters, such as 6 volt battery lights with acorn bulbs, \$5 million.

4. Paper Plans Plus Moderate Preparations (\$1.1 billion)

Same as 3 above, plus \$25 million more to make additional shelters for key workers, both of CD organizations and essential services. In selected areas, build permanent group shelters, \$1 billion.

5. Paper Plans Plus Extensive Preparations (\$8 billion)

Primarily to construct permanent shelters outside probable target areas for all evacuees and local inhabitants in the N.E. United States.

If funds for extensive preparations are made available over a period of several years, then reception and evacuation areas would be drastically changed, with permanent group underground shelters constructed in the newly designed reception areas, that could be located much closer to the cities.

FOOTNOTES TO SECTION E

1. In its 1962 publication, Exposure to Radiation in an Emergency.
2. The Probable Fallout Threat Over the Continental United States. Report No. T0-B 60-13, Technical Operations Incorporated, Burlington, Mass., 1960.
3. The Nature of Radioactive Fallout and its Effects on Man, Part 1, Hearings Before the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, Eighty-Fifth Congress, Washington: 1957.
4. The Effects of Nuclear Weapons, Samuel Glasstone, Editor, Prepared by U.S. Department of Defense, Published by Atomic Energy Commission, 1962.
5. Other examples of the effects of wind shift can be found on pages 329 to 331 of The Nature of Radioactive Fallout and its Effects on Man, Part 1, Hearings before the Special Committee on Radiation of the Joint Committee on Atomic Energy, 1957.
6. Fallout Shelter Surveys: Guide for Architects and Engineers, NP-10-2, May 1960, DOD, OCD.
7. As brought out on pages 96 to 100, and Appendix 13 of the 1957 Hearings of the Holifield Committee.
8. This assumption is borne out, for example, by the speed with which infantrymen can be taught combat principles during an actual war.
9. Civil Defense 1961. Hearings before the House Committee on Government Operations, on page 222 gives 11% for this basement access figure, but the area referred to includes Oklahoma and Arkansas, where more houses have basements than on the Texas coastal plain.
10. Shelter From Fallout, by Technical Operations Incorporated, Report No. T0-B60-30, April 7, 1961.

Section F. Food & WaterF.1 Some Food Problems and Elements of Possible Solutions

Availability of food may be just as important to the one-week evacuation plan as shelter. At present adequate food supplies are not stockpiled in most of the planned reception areas.⁽¹⁾ Furthermore, the feasibility of transporting enough food to sustain inhabitants and evacuees in food-short reception areas within the one-week is doubtful, since during that week most transportation capacity would be committed to carrying evacuees into these areas. Most evacuees probably could not bring more than a few days' food supply with them (if that). Serious food shortages may thus develop in the absence of sufficient planning and preparations prior to a crisis.

An example of the possible scarcity of food in farming districts near big cities is furnished by Orleans County, New York. This is a typical dairy farming county in New York, yet its food stocks on hand in homes, stores and warehouses would only feed local inhabitants for approximately 42 days.⁽²⁾ If evacuees add six times as many mouths to feed--as is anticipated by our calculations--the existing food supply would last less than a week.

Actually our nation as a whole has stored food reserves--mainly surplus grains--sufficient to feed survivors for several years, but not within reach of consumers in many areas.

A Stanford Research Institute study⁽¹⁾ of 1958, considering a massive attack in the mid-sixties against an America provided with fallout shelters, calculated that surviving food stocks (including foods normally used to feed animals) would provide all survivors with a 3,000 calories-per-day diet for 1,297 days if properly distributed. However, the 1958 pre-attack food storage pattern (which has not been improved since) would provide survivors in Massachusetts with only 64 days of food, while giving citizens of Iowa 9,441 days' food supply.

The number of Americans surviving these SRI-calculated attacks, which did not involve strategic evacuation of target cities, was lower than would be the case after successful pre-attack evacuations and improvised shelter-making, such as is considered in this evacuation study. Thus especially in the reception areas for great cities, per capita available foods would be much less abundant than estimated by this SRI study, which in any case lists foods for whole states.

A successful strategic evacuation may increase the number of survivors more than it would increase our ability to produce food in the immediate post-attack period. Thus some estimates of our post-attack food production may prove overly optimistic, especially if millions have been saved by effective civil defense. Two studies, (3) which did not involve strategic evacuation, concluded that even in the first year after attacks likely in the '60s, "adequate production could probably be maintained." Also there is greater awareness of the possibilities of radiation damage to plants, birds, insects, and related ecological systems.

A radical change in post-attack eating habits might even prove highly advantageous to Americans. A properly balanced "Chinese-type" diet can result in excellent health and vigor, while minimizing exposure of agricultural workers, thus conserving manpower, fuels and materials for other recovery needs, while delaying the time when contaminated foods need be introduced into the diet.

After a large attack we would probably avoid a high meat producing program, since grains offer more nutrition when consumed directly. For example, chickens must be fed grain containing about six times as many calories as the meat they provide--and chickens are the most efficient animals for converting grains into meat. Savings resulting from a vegetarian diet could be invested in recovery projects. Thus the fuels, machines and labor saved could be used in some farming areas to strip off the top two or three inches of soil which contains most of the contamination.

The importance of considering the civil defense aspects of our food stockpile is highlighted by the fact that the present Administration has reduced our agricultural stockpile substantially, and plans to continue to reduce the remaining grain surpluses drastically. Nor are there any immediate indications of our stockpiling even the most critical (3) post-attack agricultural needs--agricultural fuels and pesticides.

Difficulties inherent in early post-attack food deliveries involve considerations such as:

1. The destruction of most of the important rail centers and highways where they converge on cities.
2. High radiation intensities persisting for weeks or even months in many areas.
3. Insufficient incentives for teamsters and trainmen to undertake dangerous deliveries.

4. By-pass roads around impassible or dangerous areas might quickly break up under heavy truck traffic.

Nutritionists have calculated that 2,000 calories per person per day are adequate under shelter conditions. Actually, most people in a shelter will not lose weight unless they receive less than about 1,500 calories daily. If need be a two-week shelter diet of 2,000 calories per day can probably be stretched by most healthy people to last about a month without serious results.

Prudent planning will include stockpiling additional food reserves in the reception areas. Such stockpiling could have the following results:

1. Reduce the danger of malnutrition and starvation.
2. Reduce the harmful exposure involved in trying to obtain and distribute food in a radioactive environment.
3. Improve the chances of maintaining law, order, and effective government.
4. Provide an impressive pre-attack argument that the Government is prepared to meet its obligations before ordering a step as drastic as evacuation.

F.2 Relocation of Food Supplies

Because wheat has a higher protein, vitamin and mineral content than other grains, and can be stored for decades without serious deterioration, it is a preferred food to store in quantity for emergency use. One such plan for relocation of surplus wheat was proposed by the Department of Agriculture in an appropriation request transmitted by President Kennedy on August 4, 1961. This appropriation would have provided \$47.2 million for these stated purposes: "relocation of 126 million bushels of federally owned wheat...to areas where food shortages could exist following attack. The stocks would be located close to 191 million, and thus would make available three-fourths of a pound of wheat (per person per day) for a 4-month period."

If funds were available for an "inexpensive preparations" program, large quantities of surplus wheat could be stored in planned reception areas. Such inexpensive bulk storage of whole grain should be considered separately from ready-to-eat survival rations packaged for use in shelters.

Some congressmen disapproved of the appropriation for re-location of surplus wheat contending that Americans are not horses who can eat large quantities of raw wheat. To meet this criticism, serious consideration should be given to the idea of using a simplified type of "bulgur-processing" (steam-toasting dampened whole grain) and redrying about half of the 126 million bushels which, in mass production, might cost about one cent per pound. This re-dried, pre-cooked wheat will keep for decades and can be stored cheaply in bulk like raw wheat. The other half of this relocated wheat should be left raw so that it can be ground and made into more conventional foods.

Iodized salt should be stockpiled along with wheat. At insignificant cost the palatability of grains would be greatly improved. After several weeks, salt deficiencies could become serious, especially for people living in hot, humid shelters and perspiring more than normal.

Although at present our surplus of skimmed milk powder amounts to only about 3 pounds per capita, the vital importance of stockpiling food suitable for small babies during an evacuation and the shelter period following an attack stresses the need to include re-locating the milk powder in civil defense plans.

F.3 Desirable Shelter Foods

Civil defense literature exists which examines in detail both the characteristics of desirable shelter foods, and methods of utilizing them.^(4,5) We will not attempt to summarize this specialized dietary literature. Rather, a specific and unconventional shelter ration will be judged against USDA criteria⁽⁴⁾ for selecting shelter foods, in order to illustrate a trade-off involving modern American food habits vs foreign food habits. This might have advantages if continuing lack of funds makes it necessary to provide very austere survival rations at minimum cost. The following comparisons of this only partially tested ration, with several adopted rations, should not be construed as advocating its immediate adoption. A ration needs thorough testing under realistic shelter occupancy conditions before it can be recommended or adopted for survival use.

We will discuss a pre-cooked, basically wheat ration⁽⁶⁾ within the following characteristics:

1. 10 cents per day per person
2. 2,000 calories per day
3. Nutritionally balanced

ITEM	RETAIL COST PER DAY	CALORIES	PRO- TEIN (g)	CAL- CIUM (mg)	IRON (mg)	VITAMIN A (I.U. or U.S.P.)	THIA- MINE (B ₁) (mg)	RIBO- FLAVIN (B ₂) (mg)	NIACIN (mg equiv.)	VITAMIN C (mg)	QUANTITY RETAIL COSTS (Inexpensive Brands)
Wheat 19 oz.	3.5¢	1,850	64.8	248	18.3	0	0.30	0.81	2.46	0	100 lb. sack hard wheat \$3
Skim milk powder 1½ oz.	1.9	152	15.1	552	0.3	17	0.15	0.83	0.47	3	100 lb. sack \$20 (more for babies)
Salt 1/6 oz.	0.1										-
Cost of steam- toasting the wheat	0.5										-
Containers	2.0										55 gal. drum, and small plastic bags \$6 for 300 rations
SUB-TOTALS	8.0¢	2,002	83.5	800	18.6	17	0.45	1.64	2.93	3	
Vitamin Tablet:											
Basic ingredients of standard tablets	1.5¢					5000	2.50	2.50	20.00	50	100-500 tablet bottles; addition- al Vitamin C tab- lets may be added
TOTALS	9.5¢	2,002	83.5	800	18.6	5017	2.95	4.14	22.93	53	-
TOTALS Recommended daily allowances (NRC), 25-yr. old man (working)		3,200	70.0	800	10.0	5000	1.60	1.80	21.00	75	-

TABLE F-1
10 CENTS PER DAY SURVIVAL RATION
(Prepared in the Home)

This ration contains 19 ounces of steam-toasted, re-dried wheat, 1/6th of an ounce of iodized salt, 1/2 ounce of the dense type of skimmed milk powder used by bakers, and one multi-vitamin tablet--all packaged in a waterproof container.

The food values⁽⁷⁾ and some other details of this ration are given in Table F-1, on Page F-5. Advantages of this ration that are not noted in Table F-1 include the fact that (a) this ration contains adequate essential amino acids, and (b) due to its high density, approximately three times as many rations can be stored within a given volume as the lower-density whole-wheat shelter wafers or ordinary canned foods. The wheat in this ration, if packed in waterproof cans similar to those containing the wheat wafers, or if stored in bulk in ordinary commercial grain elevators or bins, will last for over 20 years.⁽⁵⁾ Fallout contamination will not be a serious problem with either of these storage methods.⁽⁸⁾ One cubic foot weighs about 50 pounds.

If this complete ration were canned for long-term storage in individual shelters, a convenient packaging might be a can containing 20 rations, resulting in a package weighing about 29 pounds. This sealed can could contain 23 3/4 lbs. of wheat, four 5-oz. plastic bags of milk powder, four 1-oz. plastic bags of salt and 20 multi-vitamin tablets, plus at least ten 6" x 3 1/2" x 15" waterproof polyethylene bags (of the type used to package disjointed chickens), 20 rubber bands to be used to seal these bags when they contain liquids and soaked wheat, and a bottle of iodine water-purification and utensil-disinfecting tablets. Written instructions for the preparations of rations should be included in each container.

When ordinary utensils are not available, the plastic bags can be used as receptacles in which to soak (and thereby soften) the wheat in water for 12 to 24 hours prior to eating. They are also useful as vessels in which to mix ground wheat with milk powder and water. Such waterproof bags can finally be used for waste disposal in shelters as demonstrated by current civil defense practice in West Germany.

An alternative packaging system for this dry ration would be to seal the wheat, plastic bags, and the water purification and disinfection tablets in one can, since these components have a shelf life of decades. The milk powder and vitamin tablets, that have a shelf life of about 5 years, could be packaged in other containers, along with additional small plastic bags, rubber bands, and water purification tablets.

While this pre-cooked wheat can be eaten without preparation other than water soaking, it may be desirable to provide each shelter

with a small hand-cranked grain mill,⁽⁹⁾ that costs only \$3.25 wholesale, so shelter occupants can grind their whole grain into a ready-to-eat wheat meal or flour. Such ground wheat can be mixed with water and eaten at once, like a cereal. This would not only lend variety to the shelter diet, but enable smaller children and people with poor teeth to eat a full meal more easily. Furthermore, if this wheat is finely ground in such a mill, a bran-free, easy-to-digest wheat flour can be made by simple shaking and gravity-separating. Tests would probably prove this suitable for babies and sick people. Such a bland flour, along with the milk powder, certainly provides a better food for infants than is found in the current wafers.

While a vitamin supplement may not be strictly necessary during a relatively short shelter period, it may improve or raise the general health level and the ability to withstand infection in the post-attack environment. Dr. Elmer L. Severinghaus,⁽¹⁰⁾ among others, has emphasized that an adequate intake of Vitamin C in particular tends to promote resistance to infection during times of stress. The cost of an adequate multi-vitamin supplement is approximately one cent per person per day.

A comparison of this 10-cent-per-day per person ration with the USDA criteria for shelter foods mentioned above, and with desirable qualities for an evacuation ration, is given in Appendix F-1. It will be observed that this ration meets a number of criteria better than do several much more expensive ones.

F.4 Water

There is an adequate water supply in reception areas for use by evacuees and local inhabitants before a nuclear attack. The U.S. Geological Survey⁽¹¹⁾ stated that, in 19 regions tabulated, 115 million people used an average of 148 gallons per person per day from public water-supply systems. Only one region showed a per capita use of less than 111 gallons per day. Since an ample water allowance for survival is 1 gallon per person per day in a shelter, it would appear that adequate water is available. However, there are several other considerations which must be taken into account.

Prior to an attack water may have to be rationed in some reception areas.

Most rural homes with running water (the 1960 census showed that only 36% of farm operators lacked running water) depend on electric pumps, which supply an estimated 50-60 gallons per person per day. The 36% of farm homes that lack running water had 10 gallons per person per day, as estimated by the U. S. Geological

Survey in 1955. In view of this, it would seem advisable for evacuees sent to these areas to be provided with large plastic bags, or other containers which are not too difficult to carry.

Nearly three-fourths of the water used in rural homes and for watering livestock comes from wells or springs. These sources can be protected from fallout by suitable improvised covers. Underground water will generally be free from contamination. Because of this, civil defense planning could advantageously include geological surveys to determine where shallow wells can be dug by hand in order to provide water for drinking purposes. Chlorinization or boiling may be required in some cases.

The long-term water problem has several possible solutions, including filtering, ion exchange, and settling techniques. In addition, the low solubility of fallout particles, together with natural decay, suggests that for the sixties, reservoir water, without special treatment, may usually be considered suitable for drinking, by standards appropriate to a postwar world.

The following conclusions seem valid:

- a) During the pre-attack period, the water supply should not be critical if some simple water conservation measures are put into effect.
- b) Paper plans can provide enough instructions so that adequate drinking water supplies can usually be stored for use during the post-attack period. Inexpensive plastic containers which can be made dependably waterproof by double-plying and heat-sealing two films are a hedge against a long stay in shelters or water shortages in the post-attack period.

F.5 A Suggestion for Storing Emergency Food Reserves in Reception Areas

As mentioned earlier, many reception areas today have only enough food reserves to feed an increased population for about a week. If a one-week evacuation were taking place, a sizable organization would be required to assure success in requisitioning and equitably distributing the inadequate local food reserves of most reception areas. Much of the local supplies would have to be moved from a large number of stores, warehouses, and factories in scattered locations. Furthermore, the fact that most modern American foods consist largely of water-heavy, bulky varieties, makes the job of getting a one-week's supply of these foods to evacuees' improvised shelters greater than that of distributing one month's supply of special dry rations and plastic water bags.

To indicate some of the problems that would be connected with issuing one month's survival rations to all shelters, let us consider a particular possibility in brief outline:

Suppose that it is decided to stockpile, in the northeastern reception areas, a month's supply of the wheat ration previously described. Examination of a map of the northeastern reception areas shows that in most of this region the small towns and villages tend to be situated no more than twenty miles apart. If such places are selected for food stockpiling and distribution, few householders would have to drive more than twenty miles round-trip to get a month's rations for themselves and for evacuees to be quartered in their homes.

A variety of warehouses and slightly modified steel granaries could be used to store these supplies. Or, provided these rations were sealed in cans or other vermin and waterproof containers, they could even be stored for years in home basements.

In the case of a householder with a family of 5, plus 25 evacuees quartered in his home, one month's austere supplies for all 30 people would be forty-five 29-pound cans of this wheat and milk ration, plus a small hand-crank grain mill, sixty 5-gallon plastic water bags. The total weight of all these would be about 1500 lbs. which an average passenger car in two or three trips could haul.

APPENDICES TO SECTION F

Appendix F.1
Illustrative Evaluation of a Ration

USDA Criteria for Selecting
Food for Shelters

- a) The food must be palatable, or at least acceptable, to the majority of the shelter population.
- b) Foods selected should have good storage stability, preferably a shelf-life of 5 to 10 years.
- c) Total cost (including capital investment, costs of surveillance during the period of food storage, and replacement costs of deteriorated food) should be kept to a minimum.
- d) Foods selected should be widely available. If a food is not now on the market in quantity, any special production should be simple and cheap.

Ten-Cent-Per-Person-Per-Day
Steam-Toasted Wheat Ration

- a) Although limited tests have shown that a variety of American types find this ration either palatable or acceptable, it has not been proven as yet by large numbers of citizens eating it under shelter conditions. It can be cooked, salted, or ground to meal or flour. People should survive on it.
- b) Tests⁵ at Fort Collins, Colorado have proven that whole grain wheat has a shelf-life of at least 22 years at 70 degrees; cooked and re-dried whole grains, with all organisms killed, should keep even longer. Milk powder, which can be packaged separately, keeps at least five years, as long as most shelter foods being stocked in shelters today.
- c) Total cost is far less than for any presently adopted ration.
- d) There are huge surpluses of wheat and milk powder, and special production is simple and cheap.

USDA Criteria for Selecting
Food for Shelters

- e) A relatively low protein level is desirable.
- f) The foods should have high bulk density to conserve storage space.
- g) Food preparation should require a minimum of fuel and produce a minimum of heat and vapor.
- h) Simple food preparation and serving may be essential because of extremely crowded conditions in shelters.
- i) The food and service should produce a minimum trash volume.

Ten-Cent-Per-Person-Per-Day
Steam-Toasted Wheat Ration

- e) Protein level is low, (83.5 g.), just slightly above the National Research Council minimum recommendations of 70 g.
- f) This ration has a high bulk density - 50 lbs. per cu. ft.
- g) All food is pre-cooked, hence no fuel is required; no heat or vapors are produced.
- h) The wheat is merely soaked in water by each individual, in small plastic bags packaged with the wheat. This ration is, however, more difficult to eat than biscuits or ready-to-eat canned foods.
- i) Little useless trash volume at all is produced; food cans and small plastic bags all end up serving as odor-proof containers for wastes, following established West German practice.

Appendix F.2

Additional qualities that make this ration desirable for evacuation and shelter use are the following:

- (a) Its small plastic bags can be used as flexible containers to carry several days' rations in corners of packs or in cars.
- (b) Because it is packaged in a waterproof can, this ration can withstand high humidity, vermin, and insects in storage, as well as the humidity, water and odor conditions typical of occupied shelters.
- (c) The bran it contains supplies roughage capable of absorbing water, to give a "full feeling" after a meal, and to help prevent constipation.
- (d) The milk powder it includes is good for babies and sick people.

Appendix F.3

Instructions for Steam-Toasting Wheat

The following instructions for steam-toasting hard wheat were written for housewives in Colorado, some of whom have prepared and stored it:

To prepare this wheat for steam-toasting in your pressure cooker, first select a pot just a little smaller than the inside of your biggest pressure cooker. Fill the smaller pot $\frac{3}{4}$ ths full of the dry grain and wash by pouring the grain into a dishpan of cold water. Stir the wheat with your hands, and you can easily float off the chaff. Then immediately pour the wheat into a strainer to remove all the water, and put the hard wheat grains, that are wet only on their surfaces, back into your smaller pot. You will now find that this smaller pot is now full of wheat. Check to see that no free water is at the bottom of your batch of grain.

Next place a trivet or pebbles on the bottom of your pressure cooker to act as a spacer, and set the smaller pot inside your pressure cooker. Then pour water into the space between the inner and the outer pot. Next close the pressure cooker and set it to cook at 15 or 20 pounds pressure. After it starts cooking, reduce the flame until the pressure control weight only rattles up and down occasionally, or remains at 15 or 20 pounds pressure. Inasmuch as the grain must be cooked for such a long time, do not permit

excessive loss of steam. The writer has found that when cooking 4 1/2 quarts of wheat filling a smaller pot inside an 8 quart pressure cooker, only 1 pint of water need be lost as steam to assure a full-pressure cooking.

If you are using an 8 quart pressure cooker, cook your wheat at 15 or 20 pounds pressure for one hour and thirty minutes. Your wheat will then be steam-toasted. To determine if it is well cooked, chew up a teaspoonful taken from the center of your batch. If the wheat gluten is not all cooked, you will find that there will remain in your mouth a sticky lump much like the grey, glutinous "chewing gum" you get if you chew raw wheat.

You will notice that the wheat grains have been toasted by the superheated steam to a light brown color, and are only slightly damp. If you live in a dry climate, all you have to do to completely re-dry your steam-toasted wheat is to put it in a cloth bag exposed to dry air for a few days. Or you can re-dry it at a low heat in your oven, with the door opened slightly, until it is as dry as wheat long stored in a granary. Then if you seal this thoroughly cooked and re-dried wheat in a tight container, it will remain a nourishing food for decades.

Appendix F.4

Preliminary Estimates for Pre-Crisis Costs For Five Levels of Food and Water Preparations For Strategic Evacuations of the NE United States

The following preparation costs for 46,000,000 people in reception areas out of the 54,000,000 total of the NE United States, are very roughly estimated. Since the rations, water containers, etc. considered have very long shelf lives, the costs listed below are largely non-recurring. Annual maintenance costs for these five levels of preparations is estimated to be 20% to 25% of these initial costs.

1. Paper Plans Only (\$12 million)

a. Food (\$7 million)

To make detailed regional and local plans to relocate (during an escalating crisis that has not reached the stage of compelling evacuation) available food stockpiles into the NE reception areas. Such foods should include approximately 150,000,000 pounds of surplus milk powder, almost one-third of our total current surplus, and 50,000,000 pounds of iodized salt. Pick-up, transportation, delivery and local storage during a crisis would be planned, \$2 million.

To make local plans to ration and distribute foods during and after a strategic evacuation, \$5 million.

b. Water (\$5 million)

R & D to develop methods of using local materials to store water, in and near improvised shelters, given one day to one month warning, \$100,000.

Study water resources in the NE evacuation areas and design plans for improving the prospects of getting sufficient water into or near shelters. This study would include determining means of obtaining water from local wells should power fail, locating wells independent of public power systems, listing amount of available water from wells, and conducting preliminary geological surveys to determine where emergency shallow wells can be dug (e.g., in wet basements). Print leaflets on obtaining and storing water for the different local areas, \$5 million.

2. Paper Plans Plus Inexpensive Preparations (\$145. million)

a. Food (\$126 million)

For same as 1 a, above, plus cost of an austere survival ration sufficient for two weeks, furnishing 2000 calories per person per day, and stored locally in the NE reception areas. In the event that the ration described on page F-8 is proved satisfactory, a two week's supply for the 54,000,000 inhabitants of the N.E. United States could be produced, transported and stored locally for approximately \$2.00 per person, or \$108 million. Also to buy and stockpile 2,000,000 hand grain mills at \$3.00 each, \$6 million.

b. Water (\$19 million)

Same as paper plans 1 b, above, plus locally stockpiling the best materials, as proved by R & D, for emergency water containers. If thick plastic sheeting is indicated (to make large, open, water-storage tanks in cellars and improvised shelters; a tank 10' x 7' x 2' deep holes approximately 1,000 gallons), then stockpiling enough of such plastic might cost \$8 million. In addition, water purification chemicals, \$2,000,000; instruction and training booklets and information to be distributed through newspapers, radio, and TV during an evacuation, \$4 million.

3. Paper Plans Plus Modest Preparations (\$340 million)

a. Food (\$257 million)

Same as 2 above, plus cost of increasing stocked austere rations to one month's supply, \$108 million, plus developing a ready capability to distribute the stockpiled canned rations during a possible evacuation, \$25 million.

b. Water (\$83 million)

Same as 2 b above, plus manufacturing and storing two 5-gallon water bags or other containers per person (probably of 2-ply, heat-sealed plastic film construction, at 50¢ each) \$54 million; plus contributing to development of the organization needed to distribute survival foods, \$10 million.

4. Paper Plans Plus Moderate Preparations (\$0.5 billion)

a. Food (\$410 million)

Same as 3 a above, plus cost of buying 5 lbs per person of additional milk powder (\$40 million); plus production and storage in cities of austere dry rations for use during the evacuation (5 days at 25¢/day x 46,000,000 = \$58 million); plus additional costs for storage and for creating a distributing organization, \$30 million; plus cost of distributing some of these rations to home shelters in reception areas, \$25 million.

b. Water (\$93 million)

Same as 3 b above, plus cost of distributing some water containers to shelters, and additional costs of stand-by distributing organizations, (\$10 million).

5. Paper Plans Plus Extensive Preparations (\$1 billion)

a. Food (\$0.8 billion)

Same as 4 a above, plus more varied and expensive foods. Also storage of several month's supply of raw grains in reception areas, plus changed methods and locations of storage appropriate to prepared group shelters, etc.

b. Water (\$0.2 billion)

Extensive preparations imply making permanent group shelters before the extreme crisis calling for evacuation. Such permanent shelters would have other means for storing water than those discussed above.

FOOTNOTES TO SECTION F

1. Food Supply and Production Following a Massive Nuclear Attack, by P.D. Marr, SRI Project No. IU-2324, for OCDM, October, 1959.
2. Research Symposium on Emergency Techniques for Consumer Rationing, The Brookings Institute
3. Postattack Farm Problems (Part I: The Influence of Major Inputs on Farm Production; and Part II: Attack Effects on Inputs and Farm Output); SRI Reports for OCDM, 1960, 1961.
4. Food Supply for Fallout Shelters, prepared by USDA for OCDM, Nov. 1960, CDM-SR-60-9
5. Foods for Shelter Storage, OCDM Contract No. CDM-SR-59-31.
6. Developed in western Colorado in 1961. See Appendix E.3 for preparation instructions.
7. Composition of Foods, USDA, Agriculture Handbook No. 8.
8. Effects of Fallout Contamination on Processed Foods, Containers, and Packaging, Operation Plumbob, Project 38, 1-1, TIS, Issued 5/1/59.
9. Landers, Frary and Clark, a company in New Britain, Conn., has sold eight million of these mills over the past 40 years--mostly to Latin America.
10. Personal communications with Dr. Elmer L. Severinghaus, Institute of Nutritional Studies, Columbia University in 1962.
11. Estimated Use of Water in the United States, 1955, Geological Survey Circular 398.

Section G. Medical Considerations in Crisis EvacuationG. 1 The Evacuation Phase

As indicated in the section on evacuation plans, one can visualize problems and prepare evacuation schemes based on the length of time assumed available before a nuclear attack actually occurs. Preliminary plans have been worked out for the evacuation areas of potential attack and heavy fallout in the northeastern United States in times of severe international crises. The time available for evacuation planning was estimated in one case to be a minimum of two days and, for other circumstances seven days and one month.

In the evacuation of potential target and heavy fallout areas, consideration would be given to the removal of the nonambulatory hospital population. For purposes of illustration, the removal of these individuals during a seven day evacuation period which is followed by an attack of about 1000 MT (2/3 fission) on the military and industrial targets of OCD regions 1 and 2 (exclusive of Ohio and Kentucky) is treated in some detail.

According to this proposed plan, a total of 42 million people will move by car and rail from target and fallout areas to relatively light fallout regions (Chapter V, Figure E-1) where shelters would be available or could be improvised and that already house 8 million residents. In the process of moving the general population, if time permits, special provision might be made for the nonambulatory sick and injured who require medical attention in transit, and who presumably, could be transferred to sheltered hospitals within the reception areas.

The average daily census of all hospitals in the United States, adjusted to 1962, is about 1.47 million patients.⁽¹⁾ These are divided according to categories, daily census and average length of stay in Table A. From these data, it is apparent that about 10% of the hospital population of special and general hospitals is normally discharged per day, and are presumably ambulatory. Under the threat of nuclear attack, one could reasonably expect as a first approximation to accelerate the discharge rate from general and special hospitals to 15% of the total per day. By the end of the sixth day, the remaining 10% would be the long-term, "hard-core" patients who would either have to be evacuated in special trains and ambulances or left behind as part of the 10% of the general population that is not evacuated. This amounts to a total of 11.3 thousands nonambulatory patients from general-special hospitals in OCD region 1 and 2 only (minus Ohio and Kentucky).

TABLE A
HOSPITAL POPULATIONS BY CATEGORY AND AVERAGE LENGTH OF STAY
FOR THE YEAR 1962*

	NON FEDERAL			FEDERAL	TOTAL
	<u>Special-General</u>	<u>Psychiatric</u>	<u>T.B.</u>	<u>All</u>	
Average U.S. Daily Census	539 T	664 T	47 T	161 T	1409 T
Average Length of Stay-Days	9.6		188 (1959)		
Evacuated Northeast Area, Daily Census**	124 T	153 T	11 T	37 T	324 T
Admissions Per Day Per 10,000 Population	3.58				3.65
Births Per Day Per 10,000 Population	.66				

* Increased by 2% per year from data published by the Medical Almanac 1961-62 for the year 1959.

** Based on 23% of the 1962 U.S. population evacuated to reception areas.

T = Thousands

Psychiatric and TB patients make up a significant proportion of the total hospital population (57%) and, if evacuation of the ill were contemplated, special decisions would have to be made with respect to them. It is obvious that the dangerous psychiatric and highly infective TB cases would be a menace to the general population and they either would have to be evacuated under special conditions, such as trains or vans set aside for the purpose, or would be left behind. An alternate possibility would be to evacuate them last and then only if time, transportation and reception facilities permit. This may appear to be a hard-hearted decision, but under crisis conditions when the time available for evacuation may be extremely limited, the principal objective should be the saving of the maximum number of lives.

Since psychiatric patients, once committed, usually remain in hospitals for long periods--months or years--the reduction in population during a one-week or even a one-month evacuation plan will be small. Consequently, if this class of patients were to be evacuated, provision would have to be made in the reception areas for housing them. Thus, if all the mentally ill were evacuated, the psychiatric population in these areas would increase by factors of from four to six. In order to minimize the care problems, it may be desirable to leave behind those patients that are most violent or uncooperative. While it is difficult to estimate the per cent of the total that fall into this category, it is generally agreed that it is quite small. Such individuals require a great deal more attention and space--some normally are isolated--and under the exigencies of crisis evacuation may have to be left behind with minimal custodial care.

Once the reception areas are reached, it will be desirable to reduce the psychiatric population by release of those considered to be good risks in order to minimize overcrowding in hospitals as well as to release needed medical skills and hospital beds for the short-term sick and injured. If only those psychiatric patients who are judged not to be dangerous to society are evacuated, then essentially all of these individuals can be dispersed to fallout shelters which house the general population.

Under present methods of chemotherapy, most TB patients are made non-infective with relatively simple precautions. As a first approximation, it is estimated that about 80% of the 12,500 TB patients in the Northeast are ambulatory and could be evacuated in a body without any special precautions, leaving about 2,500 behind. The 80% evacuated (9,500) could readily be absorbed by reception area fallout shelters and, if need be, some could be placed in hospitals. If an attempt were made to evacuate the remaining 2,500 TB patients, considerable advance planning would be required, since most of them would not only be incapacitated, but strict isolation procedures would also have to be observed.

Thus if a two-day evacuation were in progress, because of the requirement for special facilities and personnel, it might be difficult to evacuate more than a few of the highly infective TB patients from the anticipated initial radiation-blast area. Under the two-day extended or one-week plan, it may be possible to move them to reception areas if the evacuation of the general public has proceeded sufficiently to permit assignment of transportation and medical-aid personnel. If one month were available, there appears to be little doubt that the removal of all TB patients could be accomplished.

Average total hospital admission and birth rates appear in Table A. Thus, for the evacuation areas under consideration in the Northeast, an average of 15,300 hospital admissions per day have been occurring in 1962. Of these 98 per cent are admitted to special-general hospitals, where 2,800 births per day take place.

One question that immediately occurs is: What provision would be made for taking care of the sick, injured and pregnant who would normally have been admitted to hospitals but who are now prevented from doing so as a result of the evacuation?

During a national crisis which is accompanied by an evacuation, a great many hospital admissions, consisting of elective surgery, diagnostic procedures and treatment of the seriously but not critically ill would be postponed until the crisis diminishes. Pregnant women, those suffering serious injury or those becoming seriously ill after the crisis has started (but before they are evacuated) might receive first aid or temporary medication from laymen who, hopefully, have some basic medical knowledge. However, in each case, a decision whether the person would remain or leave would be made by the patients' friends, neighbors or family, on the basis of the anticipated time remaining, the condition of the patient and the available transport. It is quite clear that under the exigencies of an evacuation in which an attack is believed to be imminent, a number of critically ill or injured might receive inadequate medical care and might not survive the crisis period. This possibility must be accepted as one of the penalties resulting from the precautionary measures taken.

The data which appears in Table A applies to hospitalized individuals in which case statistics are readily obtainable. However, at any given time there are many more individuals who are temporarily incapacitated at home than are hospitalized. The U.S. Public Health Service has estimated that 168 million people averaged six days in bed in 1960.⁽²⁾ Thus in the northeast area which is being considered here, 317,000 people might be ill enough to be confined to their homes on any day that an evacuation might be initiated in 1962 (data adjusted for population increase and hospitalized patients). However, on the average, 53,000 (16%) of the incapacitated would recover per

day and, theoretically, all would have been evacuated with the healthy population by the end of seven days. However, here, as in the case of the hospital patients, perhaps 10% of the total would still be bedridden by the seventh day and in each case family, neighbors or friends would have to decide whether or not the patient should or could be evacuated and by what means.

The fact that people are being evacuated in a time of national emergency may alter the incidence of some diseases or the mobility of the individual. Thus ulcers, normally controlled, may perforate; heart attacks may increase; and, conversely, some people with colds, sinusitis, ulcers and psychosomatic complaints may find they can participate in evacuation and even assist others in spite of their complaints. However, it is clear that injuries due to accidents and serious illnesses will occur during the time of evacuation and that some bedridden patients may need assistance in transit. One possibility that might be considered, where modest preparations are included in the planning, is the setting up of medically staffed first aid stations at intervals along major evacuation roads.

An alternate possibility goes even further and would not only place first aid stations along major roads, but would evacuate incapacitated hospital and possibly psychiatric patients by special hospital trains. These trains might be advantageous not only from the point of view of the patient who requires attention in transit, but they would also serve the purpose of keeping medical teams--physicians, nurses, orderlies, technicians--together as functional units. When the trains were no longer needed for evacuation, their readily transportable medical supplies could be moved quickly and added to the resources of the reception areas. However, planning the evacuation must be considered in relation to the time available. When one considers that a bedridden patient probably requires as much room on a train as at least two well individuals and that it probably will require at least twice as long to load the trains with the sick as with well individuals, in a dire emergency such as a two-day evacuation, a choice may have to be made between evacuation of the sick or the well. In a one-week or one-month evacuation plan, the choice may be restricted to sequence rather than whether to evacuate the ill at all.

Because of serious organizational shortcomings in past emergencies, (3) the need for disaster plans for hospitals is widely recognized. Most hospitals have disaster plans which not only provide for a large influx of patients but also include plans for evacuation of the buildings in case of fire. Thus, existing hospital disaster plans might be modified to include such items as a rationale for selecting those patients who will be evacuated from the hospital, the rate at which they will be removed, and provision made for their transportation to the evacuation site.

From the medical point of view, the cost of planning for evacuation of the sick and injured is not great whether one is considering a plan on paper only or some relatively simple additional preparations. For example, if first aid stations along the major evacuation roads are considered a necessary adjunct, then the cost is nominal. An added advantage of such a provision would be that first aid stations in contrast to emergency hospitals are quite mobile and can be moved in a matter of minutes. Their movement to reception areas might also be phased to coincide with the arrival of most of the evacuees.

There are about 35 main evacuation roads in the Northeast averaging in length about 150 miles. If first aid stations were located in gasoline filling stations, about 50 miles apart and contained the barest of medical necessities--say \$1,000-2,500 worth of supplies--the total cost would be \$70,000 to \$175,000. The staff of each aid station might typically consist of 12 physicians and 20-25 assistants. The staffs for the first aid stations would be drawn from either the local medical population or from evacuated medical staffs but in either case assignments and briefing of these teams would be a part of the total evacuation plan. Assuming each physician worked five hours and rested three hours and the austere medical attention given under the circumstances required an average of 15 minutes, each first aid station could treat 720 patients per 24 hour period.

When considering medical evacuation trains, there are two possible functions that they can play: (a) they can simply be evacuation vehicles or (b) they might also be used as combined living and medical quarters after fallout has decayed to an acceptable level. In the first case, medical trains would not be pre-stocked, but as patients were placed aboard, pre-designated lightweight (not over 100 lbs. per unit) medical supplies from hospital or warehouse inventories would also be loaded. In transit, no attempt would be made to do more than the minimum required to maintain sanitary conditions and keep the patients alive. Thus, assuming a one-week evacuation plan were put into effect and utilizing an estimate of 40 incapacitated or 100 psychiatric patients per railroad coach, and 25 cars per train, a total of 86 trains would be required to evacuate from the Northeast all of the 153,000 hospitalized psychiatric patients, the "hard-core" special-general hospital patients (10%) and the TB patients who are highly contagious (20%). This figure is given as an upper limit, since some patients undoubtedly could not be moved for medical reasons and some hospitals would be in areas where it would be easier and quicker to send some or all patients by car.

One of the possibilities to be considered is whether to place portable hospital equipment aboard evacuation trains, so that the facilities would be readily available after the fallout from a nuclear attack has decayed to safe levels. Such equipment is now in the possession of the various state and civil defense organizations in the form of pre-positioned, pre-packaged emergency hospitals which are distributed throughout the nation outside of urban areas. However some modifications to two or three coach-type cars as well as some of the pre-packaged hospitals units would be necessary. Such modifications might include an increase in the water tank capacity, installation of electrical adapters and reduction in weight of the X-ray table and tube stand from its present 525 lbs.; also the cots should be readily convertible to litters that can be hung in racks in the railroad cars. As a first approximation, it is estimated that modification of an emergency hospital and the required railroad cars might be accomplished for less than \$5,000. However, it should be realized that during evacuations such emergency hospitals aboard trains will have somewhat limited usefulness since the main emphasis will be on keeping medical procedures to a minimum while in transit.

The above scheme for keeping emergency hospitals 'where the people are' during evacuation should be compared with a plan which is simpler logistically. This plan would pre-position new and existing emergency hospitals in reception areas primarily. As shelters in anticipated high fallout areas become available and population movement, in case of national crisis, is gradually de-emphasized, the concentration of emergency hospitals could be shifted back to correspond to the new plans.

The reception areas in the northeastern region under consideration have a present (1962) total of about 72,000 non-civil defense beds and about 16,000 civil defense emergency hospital beds making a total of 88,000. The population of this area is about 7.8 million giving a ratio of about 90 people per bed. Should evacuation take place with its accompanying lowering of health standards as a result of crowding, localized shortages of medication, insufficient sanitary facilities, etc., the percentage of non-attack disabled could be expected to rise sharply. Also, at the same time, the ratio of people to hospital beds would rise to about 450 in the Virginias and as high as 630 in the Vermont-New Hampshire areas. If 50% of the 440 emergency hospitals now in the northeastern evacuation areas under consideration were moved to the reception areas, the average population/bed ratio would decrease to about 380 people/bed. If new civil defense hospitals, which are presently being acquired at the rate of 750 per year, were pre-positioned in reception areas only for the next two years, then this ratio would be further reduced to about 300 people per bed.

As the acquisition of new emergency hospitals progresses, plans as to the number to be positioned in reception and evacuation areas could be revised on the basis of the increase in available fallout shelters in the evacuation areas and the consequent reduction in the number of people to be moved.

G.2 Health Considerations During the Time that Evacuees
Remain Within Improvised Fallout Shelters

The crowding of 50 million people into improvised fallout shelters in an area which a few days before had housed only about 8 million individuals will lead to numerous medical, sociological and psychological problems which should be anticipated in so far as possible. The more obvious health considerations are:

1. Care of the sick, injured, and pregnant
2. Protection from radiation
3. Sanitation
4. Special Problems

Upon leaving their trains and cars, all ambulatory evacuees are expected to find protection from fallout as well as the elements in shielded portions of existing buildings or to improvise shelters in basements of homes and buildings; in the Northeast, 90% of the buildings have basements.

If the evacuation program includes the transport of the seriously sick, injured and pregnant, they could be sheltered in those emergency or non-civil defense hospitals which offer a reasonable degree of protection from fallout--say, at least a reduction in gamma ray intensity by a factor of 10. Those individuals who are less seriously ill and who do not have contagious diseases would be placed in non-specialized fallout shelters along with the general population. These shelters presumably would be stocked with some of the common medication required to tend to the needs of the sick and injured.

Under normal peacetime circumstances the admission rate to hospitals is 3.65 per ten thousand population per day. Some of the most common ailments for which people were admitted to short-stay hospitals in the United States and their respective admission rates from July 1957 to June 1958 are listed in Table B. From this list it is apparent that some hospital admissions can be postponed or obviated while others cannot. For example, deliveries cannot be delayed; most heart and appendicitis attacks require immediate hospitalization, but most admissions for hernia and hemorrhoids are elective. Similarly, almost all fractures and intracranial lesions require immediate expert medical attention while most of those

TABLE B

THE HOSPITAL ADMISSION RATE FOR A SELECTED SET OF CONDITIONS
IN SHORT-STAY HOSPITALS IN THE UNITED STATES
JULY 1957 - JUNE 1958

	<u>No. Per</u> <u>1000 Population</u>
Malignant Neoplasm	1.5
Allergic, Endocrine and Metabolic Disorders	2.6
Intracranial Lesions	0.6
Heart Disease	3.2
Hemorrhoids	1.4
All Respiratory Conditions	13.1
Ulcers of Stomach and Duodenum	1.7
Appendicitis	2.5
Hernia	2.7
Deliveries	40.6
Diseases of the Skin	1.2
Arthritis	0.9
Fractures and Dislocations	3.9
Observation Only	0.8

Health Statistics, Series B-7, Dec. 1958, U.S.D.H.E.W.

admitted for diseases of the skin, observation, allergic and endocrine disorders can be postponed. If, as a first approximation, one assumes that 50% of these admissions are deferrable, then about 9,000 out of 88,000 civilian and civil defense hospital beds will be required per day for the sick and injured. It should be pointed out that none of the civilian hospitals or the buildings in which the CDEH's would operate have been designed as fall-out shelters. Should a nuclear attack occur, it will be necessary to restrict occupancy of these buildings to those areas deemed to give a tolerable reduction in radiation intensity.

Under post-attack conditions, most shelters will not have expert medical assistance of physicians or nurses, so laymen will be called upon to undertake treatment of most of the illnesses that would occur. Some readily communicable diseases such as measles, flu, colds etc. may, in fact, show a marked rise in incidence in that they could be expected to spread rapidly because of crowding, to non-immune individuals within a shelter. On the other hand, their spread would be inhibited after an attack so long as there is no contact between the occupants of different shelters.

Under the circumstances, it might be desirable to supply each fall out shelter with some basic medical supplies which might permit a layman to undertake treatment of more serious medical situations than he would normally attempt as well as some simply phrased medical information pamphlets which a person of average intelligence, but no special medical training, could read and understand. Assuming an average shelter holds 20 people, that the cost of the medical information bulletins is \$.25 each and medical supplies cost \$10 per shelter, then the expenditures for 50 million people would be:

\$625,000 for literature
\$25,000,000 for medical supplies

To these basic supplies would be added those that the evacuees have brought with them, those already present as part of the supplies of the household or building in which shelter is obtained and, as the fall-out decays away to levels which are tolerable for short periods, those available in local drug stores.

The medical self-help training program being conducted by the states with the cooperation of the U.S. Public Health service can pay handsome dividends should a national crisis develop. An individual who knows some fundamentals and has a few medical supplies and some medical instructions for reference can not only provide much needed assistance but also can serve as a focal point for morale building. The present goal of the U.S. Public Health Service is the training of one person in four in the U.S. population at the rate of 5 million people in fiscal 1963 and 10 million each year thereafter.

Consideration might be given to ways and means to accelerate this training program in which the basic cost is a demonstration kit costing about \$45; there is a small additional charge for give-away literature after the initial supply (which is adequate for 100 trainees per kit) is exhausted. If one assumes that a kit is used 5 days per week, 50 weeks per year and that the average class consists of 25 trainees, then at least 10,000 kits are needed during fiscal 1962 for the entire United States and double this number during succeeding years. In practice, 25 trainees per class may be optimistic and one kit per 700 mi^2 too sparse so that a more realistic figure may be 30,000 and 60,000 kits for fiscal 1963 and 1964 respectively.

The present self-help medical program is being taught by volunteer instructors. Assuming, as a first approximation, that an instructor conducts classes on alternate days, then about 60,000 and 120,000 instructors in 1963 and in succeeding years respectively would be required if the number of self-help graduates stated above are to be trained by the specified dates.

According to one fallout calculation for the $\sim 1,000$ MT attack on the Northeast, the two-day integrated dose for most of the reception areas which we have chosen would not be expected to exceed 900r.⁽⁴⁾ A convenient rule of thumb is that the two day integrated dose is equal to 2.5 times the 1 hour dose rate. Thus 900r over 2 days would correspond to 360r per hour at 1 hour after detonation. This radiation level would decay to 4.3r/hr at 40 hours (Table 9.11, "Effects of Nuclear Weapons," 1957), a level that is tolerable for short periods. Thus in case of critical illness, if the location of expert medical advice is known and not more than an hour or so is required to reach it, it may be deemed advisable to "trade-off" an undesirable but tolerable exposure to radiation in exchange for such services.

The maintenance of desired sanitary conditions may be difficult for 50 million people who are used to virtually foolproof plumbing and who are crowded into spaces that normally hold less than 10 million. However, a number of solutions to this problem have been studied. These range from relatively expensive chemical toilets to inexpensive plastic bags for use during the time that the population is restricted to fallout shelters because of the high intensity of external radiation. The use of the bags may not be the most aesthetic procedure but it has the advantage of being very inexpensive--perhaps a cent a bag--and each bag can be used a number of times before it is discarded. Therefore, the use of plastic bags for sanitary purposes is consistent with an evacuation that is based only on plans that require very small expenditures for the stocking of supplies.

As soon as the external radiation-level has decreased sufficiently, it will be possible to leave the shelters for short periods and use the toilet facilities in the portions of buildings which are external to the fallout shelters. If the water system is not functioning, slit trenches can be used for the same purpose. In either case, exposure to a small dose can be traded for the achievement of a specific objective. Thus in a reception area that received a two-day dose of 900r, 10 minutes outside the fallout shelter at 40 hours post-attack would result in exposure to a whole body dose of 0.72r.

G.3 The Post-Shelter Phase

The post-shelter medical-public health recovery process may be divided into (1) the immediate period following first emergence from fallout shelters and (2) long-range considerations.

Due to the pressures of evacuation, which could result in separation of members of a family, illness, abandonment of possessions, insufficient food, medicine, or clothing etc., it can be expected that many individuals will develop neuroses and anxiety syndromes which could manifest themselves in such diverse ways as psychosomatic complaints or, in some, as profound mental disturbances. Also, under the crowded conditions existing in fallout shelters, it will be more difficult to prevent contagious diseases such as whooping cough, mumps, flu, dysentery etc. from spreading to others in the same shelter. On the positive side, shelters in themselves act as "isolation" wards thus tending to minimize the spread of contagious infections throughout the population.

If an international crisis should occur and an evacuation were ordered as a precautionary measure, no one, in or out of government, can know with absolute certainty that a nuclear attack would occur. As a matter of fact, it is quite conceivable that an evacuation could be interpreted as an indication of determination which might serve to reduce international tensions to a point where no attack occurs. Under these circumstances the government of the United States is faced with the task of minimizing the impact of displacement on perhaps half of the population, some forty million of whom reside in the northeast.

One of the main considerations, in addition to food and shelter, will be to make available trained medical help and medical facilities as quickly and efficiently as possible in order to take care of the accumulated medical case load even though physicians and patients are living under difficult circumstances and their relationship with each other as well as members of the community may be of a temporary nature.

There are presently 167 physicians per 100,000 population in the northeast United States⁽¹⁾ and this ratio would not change materially should an evacuation of the urbanized areas take place. However, as has been pointed out previously, the two other basic requirements for medical practice are supplies and medical facilities. The stated objective of the U.S. Public Health Service is to give each 200-bed emergency hospital enough supplies to last for 30 days, assuming capacity load. Assuming each emergency hospital in the reception area has received its medical supplies and that each non-civil defense hospital is similarly supplied (a condition that does not exist in 1962), then the reception area hospitals will be able to supply 2.64 million hospital-days in a 30 day period. Based on 1957-1958 statistics⁽⁵⁾ which have been modified for the population existing in 1962, and assuming that only 25% of the normally occurring acute cases are deferrable under reduced crisis conditions, then 2.68 million patient-days will be required in a 30 day period. While hospital services would appear to satisfy the anticipated requirements, it should be kept in mind that demands can be expected to fall off abruptly during the height of the crisis but to peak as soon as tension relaxes. Under those circumstances, hospital facilities can be expected to operate under great pressure immediately after a crisis. How long these pressures continue will depend upon the duration of the crisis as well as the relation rates at which the medical and lay populations return to the evacuation areas.

On the other hand, if an evacuation is followed by a nuclear attack, the medical situation would be considerably different since there would not only be a back-log of non-attack-connected sick and injured who would accumulate during the evacuation and in-shelter phase but, superimposed, there would be those who, for a variety of reasons, had received sufficient amounts of part or whole body radiation to result in symptoms of radiation injury or sickness. Under these circumstances, movement of individuals outside of shelters will be restricted for possibly 2-8 weeks postattack and it may be necessary in the more urgent or critical cases, to trade-off exposure to radiation in return for life-saving medical assistance. A desirable adjunct may be the development of a mobile shielded vehicle which would permit movement between shelters and hospitals at an earlier date than would otherwise be possible. However, under the best possible circumstances, movement can be expected to be so restricted because of fallout during the immediate postattack period, that most treatment will, of necessity, be undertaken by laymen who may possibly have received some self-help training, and who will have available to them some of the more common drugs and therapeutic adjuncts as well as some simple medical instruction pamphlets. As soon as it is possible to transport the most seriously injured to hospitals, the most austere triage will have to be imposed until the pressure on medical and para-medical skills, hospital beds and other

facilities have been brought in balance. The "over-taxing" period might conceivably last for a week or two in some areas and months in others.

The scarcity of medical supplies could become a serious problem unless adequate provision is made to stockpile them in reception areas in the immediate future. As shelters become available within the evacuation areas in future years, and less of the population is evacuated, the distribution of needed stockpiles could be altered accordingly. At the present time, if evacuation were undertaken in the Northeast according to the proposed plan, five out of nine medical supply depots would have to be abandoned, at least temporarily, since they are located in probable high intensity fallout zones⁽³⁾ and at appreciable distances from the reception areas.

For some areas, it might be necessary for the occupants of the shelters to remain inside, except for short necessary excursions, for a month or even longer. Under these primitive conditions, various insects, some of which act as disease vectors, could be expected to increase in numbers. These would include not only flies, but mites, ticks, bedbugs, lice and the like. It would seem desirable to include in the basic shelter stores insecticides and even rat traps since rats and mice are well known as both direct and indirect transmitters of disease.

It is probable, that for the assumed attack, most cows will die of radiation sickness since few are expected to be sheltered from fallout. Those that survive can be expected to transmit some activation and fission products in their milk and milk products since their fodder will probably become contaminated within a short time after the fallout begins. Hence it is desirable that large quantities of dried milk be available for the sheltered population, especially for infants and children. Dried milk is deficient in butter fat, which contains most of the vitamins A & D, so that some provision should be made for replacing these vitamins from other sources. It can be expected that the diet generally in a post-attack environment will not be very varied. Hence, it is suggested that those foods which might be used for an extended period, both in and out of shelters, should be examined thoroughly from the nutritional point of view and that adequate provision be made for supplying those minerals, essential amino acids, vitamins etc., in which they are deficient.

Inasmuch as the manufacture of pharmaceuticals and biologicals is expected to be interrupted for at least six months and possibly considerably longer, it is helpful to list some of the most common disabling illnesses and their incidence. (Table C). To this list should be added radiation sickness, since it is probable that some of the people who reach the reception areas will be exposed, through

TABLE C

INCIDENCE OF THE MOST COMMON DISABLING ILLNESSES BY AGE GROUPS
AND OF INFECTIOUS DISEASES FOR ALL AGES (1959)

<u>Diagnosis</u>	<u>Rate Per 1000 Population</u>			
	<u>15-24 Yrs.</u>	<u>25-44 Yrs.</u>	<u>45-64 Yrs.</u>	<u>Over 65</u>
Flu	59.4	79.9	69.7	72.1
Cold	42.9	35.4	36.1	39.1
Accidents	37.5	40.3	43.5	50.8
Bronchitis	34.9	35.9	44.2	51.4
Sore Throat	21.2	14.9	11.6	
Appendicitis	16.3	10.5		
Tonsillitis	14.4	15.1		
Enteritis	9.1	10.5	13.0	18.4
Teeth and Gum Disturbances	7.5			
Sinusitis	5.1			
Arthritis		7.8	20.5	42.0
Female Disorders	16.2	18.7	11.6	
Deliveries and Abortions	48.3	57.8		
Heart Disease and High Blood Pressure	7.3	31.8	124.0	87.3
Malignant Neoplasm				18.6
Diabetes	0.9	4.4	20.4	39.2
Ulcers	1.6	22.6	27.4	20.2

<u>Diagnosis</u>	<u>Rate Per 100,000 Population</u>	
	<u>All Ages</u>	
Typhoid	4.2	
Scarlet Fever and Strep Throat	190.0	
Diphtheria	0.5	
Whooping Cough	22.7	
Meningococcal Infections	1.2	
Acute Polio	4.8	
Small Pox	0	

ignorance or otherwise, to sufficient radiation to produce symptoms of radiation sickness. The rates listed in Table B are characteristic of peace time non-evacuation; these could be expected to change both in magnitude and in relation to each other under fallout conditions. Thus the appendicitis rate would probably remain fairly constant, accidents might decrease because people are essentially immobilized, heart attacks and miscarriages might increase, while the infectious diseases would probably decrease during the in-shelter phase. It is even possible that, as sanitary conditions deteriorate, such diseases as typhus and typhoid, which are essentially non-existent in the United States, would show a recrudescence.

Perusal of the list of illnesses and evaluation of other causes of disease in Table C indicates that in addition to the more common pharmaceuticals such as analgesics, soporifics, sedatives, anesthetics etc. there are four basic categories, broadly classed as therapeutic adjuncts, which are desirable.

These are:

- (1) antibiotics
- (2) vaccines and anti-sera
- (3) whole blood
- (4) special: insulin, steroids, adrenalin, etc.

Whole blood has the shortest shelf life, 28 days, and requires constant refrigeration until its use; it is not currently stock-piled as a part of the national medical reserve. Under attack conditions, blood typing as well as other laboratory procedures will probably be held to the barest minimum. Therefore, it may be desirable to carry out a blood typing program on a national scale, especially for the purpose of identifying universal donors. However, the items which constitute the remaining above categories are stored in 29 depots through-out the country or in manufacturers' warehouses and are either replaced as their potencies decline below acceptable levels or are used prior to deterioration and are then replaced by fresh stock.

The above evaluation has been made with a view to identifying some of the major bio-medical considerations before, during and after a national emergency which has been judged critical enough to justify evacuation of expected target and fallout areas in the United States. This evacuation has been treated in some detail for the northeastern area but many of the comments made apply with minor changes to the rest of the country. An attempt has been made to point out the influence of variations in parameters such as estimated duration of crisis before the attack, the year; i.e., 1962 vs. 1965, the advantage that can be gained by plans only and the influence on this advantage of some simple, low cost preparations.

Whether or not an evacuation is justified under a particular set of circumstances does not come within the purview of this section, but it is equally clear that if an evacuation of parts of the United States is ordered, a great deal of suffering and a great many casualties can be avoided if proper planning and possibly some simple preparations have been completed in advance.

The following outline represents some of the more important points made in the above discussion and includes some recommendations. The implementation of some of these recommendations would require the spending of appreciably larger sums than indicated under the heading of "Plans Plus Inexpensive Expenditures." For example, the expansion of community fallout shelters to house CDEH's could easily run to one billion dollars if provisions were made for each of the proposed 9500 hospitals. Additionally, if \$100 worth of medical supplies were to be stocked in each fallout shelter in the Northeast, instead of ten dollars worth, the cost of this item for that section of the country alone would rise to \$250,000,000. When one adds to these figures costs for an expanded medical training program for medical, para-medical and lay personnel, additional back-up medical supplies as well as additional CDEH's, the budgets could readily reach five billion dollars. However, since inexpensive costs for the immediate future appears more realistic, the latter has been emphasized in the outline below.

Medical preparations for a nuclear attack on the U.S. by various governmental agencies have been based upon the following major items:

1. the purchase and storage at pre-selected sites of 200 bed civil defense emergency hospitals (CDEH's)
2. the purchase and storage of medical supplies in 29 government operated warehouses as in manufacturers' depots.
3. the training of medical, para-medical and lay people in emergency medical procedures.

From 1951, when the program started to 1962, a total of \$38.4 million (none from 1957-1962) had been spent for 1930 CDEH's by the federal government (386,000 beds). These have been stored outside of urban areas in fire-and element-proof buildings without regard to their suitability as fallout shelters. The current objective is 9500 CDEH's; the current purchase rate is 750 per year.

A total of \$131.8 million has been spent for the stored medical supplies which it is hoped will last the hospitals for 6 months until the flow of pharmaceuticals can start again. A recent policy decision by the USPHS will result in distribution of stored medical supplies to the CDEH's to increase operational capability from 3-4 days to 30 days.

The medical training program is being implemented by the various states with the assistance of the USPHS. Training of medical personnel is channeled through the medical societies while the para-medical people (technicians, dentists, veterinarians, nurses etc.) can be trained with the cooperation of their hospitals or in non-institution sponsored specialized classes. The real key to this whole program lies in the training of laymen since, if an attack occurs, everybody will be "on his own" in shelters for from 2-8 weeks depending on where they are. The stated objective of the USPHS is to train 1 in 4 people at the rate of 5 million in fiscal 1963 and 10 million in the succeeding 4 yrs. For this purpose they have available 5000 training kits for classroom instruction.

If one considers evacuation of urban-industrial target areas to be desirable, then a number of modifications which are tied to

- (1) paper plans
- (2) paper plans plus small expenditures
- (3) paper plans plus moderate expenditures
- (4) paper plans plus large expenditures

should be considered.

Paper Plans

- (a) Modify hospital disaster plans to include not only evacuation in case of fire or, conversely, the influx of large numbers of patients such as
 - (1) ambulatory but sick
 - (2) incapacitated but non contagious
 - (3) incapacitated but contagious
 - (4) dangerous (psychiatric)to reception areas.
- (b) Plans for care of patients in transit
- (c) Plans for distribution of patients to shelters in reception areas.
- (d) Plans for pre-positioning newly acquired hospitals in reception areas rather than in evacuation areas during those years that evacuation is a part of national preparedness.
- (e) Plans for establishing a priority system for the back-log of medical cases which will have accumulated following an in-shelter phase but no attack.

- (f) Plans for triage and treatment of the sick and injured, including various degrees of radiation sickness, should a nuclear attack occur. In this situation, the attack may have been preceded by an evacuation and prolonged in-fallout shelter phase. There would thus not only be a back-log of non-attack sick and injured but many with attack-connected injuries.

Plans Plus Inexpensive Expenditures

- (a) Establishment of first aid stations along the major evacuation routes. There are about 35 main evacuation routes in the northeast averaging 150 miles each. If first aid stations are placed 50 miles apart and contain \$1000-2500 worth of supplies each, the cost would be \$70-125,000; on a national scale, \$260-465,000.
- (b) Supply each fallout shelter with an easy to read medical primer and \$10 worth of medical supplies. Total cost for the northeast (50 million people and 20 people shelters): \$625,000 for literature and \$25M for supplies.
- (c) An additional 25,000 self-help training kits for the entire country: \$1,125,000.
- (d) Speed up self-help training program with paid instructors: 100M-500M for U.S.; \$2.5-\$10 annually.
- (e) The development of a mobile, shielded emergency vehicle for perhaps \$100,000-\$500,000.

Recommendations:

- (1) The self-help medical training program is vital but is inadequately funded; at its present rate, it cannot attain its stated goal of 50M Americans trained in 5 years. Evaluate realistic costs and support it with paid instead of voluntary instructors if necessary. This program can "pay-off" in peacetime as well as wartime.
- (2) If evacuation is contemplated, re-evaluate the distribution of CDEHs.
- (3) Plan to place CDEHs in fallout shelters, preferably as part of community shelters.
- (4) Study the feasibility of evacuating long-term hospital patients.
- (5) Intensify the training of medical-paramedical personnel in disaster-medical techniques and triage.

- (6) Study the epidemiological consequences of exposing large populations to chronic, low-level radiation.
- (7) Study and provide for in-shelter and post-shelter control of various disease vectors.

FOOTNOTES TO SECTION G

1. Medical Almanac 1961-62, W. B. Saunder Co.
2. Statistical Abstracts of the United States, 1961.
3. Emergency Medical Care in Disasters, Study No. 6, NAS-NRC
Pub. 457, 1956.
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Section H. Evacuation Command and Control

This section will examine some command and control requirements, and it will present a sketch and a discussion of a plan for the one-week evacuation mentioned earlier. In developing the plan, certain existing or soon-to-be existing facilities, equipment and arrangements which will be specified later are available in addition to especially prepared plans and certain preparations which can be put on paper. More expensive programs will not be considered. Although it is not possible to be comprehensive and detailed in a brief statement, it is hoped that the section will provide some perspective on the problem of managing an evacuation and some useful suggestions for solving them.

The information regarding existing facilities and evacuation problems which is used in this section is drawn mainly from published OCD materials and other sections of this chapter.

The goals of command and control in evacuation are listed in decreasing order of importance. Ideally no low priority goal should be considered until higher priority goals are assured. In practice, the ideal can be approached but not achieved owing to the multi-faceted nature of design choices. In attempting to satisfy these goals, complex and difficult-to-assess trade-offs would be necessary. In any event the discussion here will be concerned almost exclusively with the item of primary concern--completing the evacuation in the allotted time. It is assumed that mechanically perfect evacuation is beyond reach, but that paper preparations would aid in achieving goals. Considerable confusion and waste would undoubtedly occur in any evacuation attempt.

PLANNING GOALS

1. Complete the evacuation in seven days
2. Maximize⁽¹⁾ the length of time evacuees can remain relocated
3. Retain ability to evacuate some part of the unevacuated support and other people
4. Distribute evacuees to achieve adequate protection--theoretically.
5. Minimize⁽¹⁾ social and psychological distress
6. Maximize⁽¹⁾ ability to return evacuees swiftly
7. Retain ability to move evacuees even further away than programmed reception areas
8. Minimize ⁽¹⁾ costs of evacuation.

Command and Control Requirements

The operating evacuation system may be viewed as having four interlocking functions: planning, assembling, transporting, and relocating. Each function has subelements which are mainly associated with the parent function but may also be associated with other functions. Following a discussion of the operational elements of a one-week strategic evacuation there will be some comments on equipment which would be required; communication facilities needed; and personnel requirements as to numbers and skills.

Before these subjects are developed, the assumptions upon which this discussion is based will be presented in order to indicate some of the specific limits of the plan which is offered.

Assumptions:

A. Background Factors

1. It does not snow heavily before or during the evacuation
2. Federal efforts to mobilize do not interfere
3. Military operations do not interfere with the evacuation
4. The incident(s) which precipitated the evacuation did not result in destruction of enough of the homeland to affect significantly communications and transportation
5. Any changes in military posture prior to the evacuation did not alter too much the distribution or availability of transportation
6. Civil defense preparations, other than planning for evacuation and improving protection, are approximately as they are today

B. Critical Elements of Operations

1. There would be enough personnel for transportation and communications and other essential jobs
2. The spontaneous evacuation in evacuation, boundary, or reception areas is either kept under control or permitted in ways that do not interfere significantly with planned evacuation
3. No options for:
 - a. Evacuees regarding preferred reception areas;
 - b. People who are away from home on a trip and who may wish to return;
 - c. Evacuees regarding preferred forms of transportation.

4. People may elect to remain in evacuation areas.
5. Personnel needed to support essential personnel and others remaining would be among the 10% unevacuated.
6. Official information sources are adequate for giving information and for controlling rumors.
7. Evacuees are adequately motivated.

Planning Requirements

To fulfill the requirement for strategic evacuation plans and options, the following capabilities are necessary to some degree.

PLANNING REQUIREMENTS

1. Formulation of plans and options
2. Evacuation of effectiveness and revision
3. Updating as parameters change
4. Distribution of current plans and options
5. Dynamic revision during the evacuation

Plan formulation may be done using various mixes of personnel and data-processing assistance, which have various levels of sophistication, and types of criteria. Basic to these considerations is the command and control philosophy which would guide the entire development process. Centralized planning done at the federal level would probably produce more consistency between areas than decentralized planning done at state and local levels, but unique requirements of areas might be lost. As in any complicated problem, the optimum balance of command and control emphasis is not amenable to calculation but must be estimated.

In developing plans and options to accommodate a variety of circumstances, the following variables would play a significant role.

PLANNING VARIABLES

1. Possible frequencies of group movement to reception areas
2. Number of evacuees in evacuation area
3. Types and characteristics of transportation available by area
4. Routing possibilities
5. Distances from evacuation to reception areas
6. Possible effects of various kinds of accidents in evacuation areas, during transportation, and in reception areas
7. Characteristics of assembly and relocation areas
8. Speeds of transportation

From the above and other factors, determination of the following would be made and plans including these determinations distributed prior to evacuation.

PLANNING ARRANGEMENTS

1. Evacuee group sizes
2. Pairing of evacuee groups to types of transportation and times of embarkation
3. Rate of group movement
4. Pairing of evacuation groups to reception areas
5. Criteria for initiating contingency plans

During evacuation it may be necessary to alter prepared plans to operate more efficiently. Precipitating circumstances could be the occurrence of conditions beyond the range of conditions for variables which were included in the plan: the appearance of conditions outside the variables considered; and unanticipated magnitude of interaction between recognized variables. Under these circumstances replanning may be desirable.

Updating of plans would be required for two reasons. The first is that parameters used in deriving the original plans will, with passage of time, have altered in some significant way. For example, a new interstate highway may be opened, or a railroad line abandoned. The second reason is that a new variable may become apparent such as the possibility of using air transport in certain locations, or the belief that nuclear warheads characteristics have changed sufficiently to make some reception areas less attractive.

Evaluation of plans, as distinct from updating of parameter values, refers to periodic assessment, using realistic criteria, of the calculations, estimates and assumptions upon which the plans are based. The ultimate goal is to assess overall capability. Possible evaluation methods are live and simulated exercises, and mathematical and physical models from which the role of plans can be identified and evaluated. Revision, then, follows evaluation and is essentially replanning parts of whole plans.

Assembly Requirements

Assembly of transportation and groups of evacuees requires both plans and an active control capability. Assuming that plans have been made, the requirements for control of the assembly processes will be discussed. The basic distinction that has to be made concerns the forms of transportation to be used by evacuees and how to distribute individuals among them. After this step, the problems of queueing, communication, and contingency-handling become central to control.

In outline form, the requirements for assembly control are the following:

ASSEMBLY REQUIREMENTS

1. Transportation assignment
2. Evacuee group assignment
3. Preparation of vehicles--gas, oil, tire check, if cars; preparing rolling stock, if trains
4. Determination of specific times and places of evacuee group embarkation
5. Communication of items 1, 2, and 3 to evacuees
6. Implementing evacuation area movement control
7. Activating feedback loops regarding status of evacuee groups and transportation internal to the evacuation area
8. Maintaining capability of reassigning individuals, groups, and schedules as required by extra-evacuation area contingencies

Because these terms probably convey enough meeting for the purposes of stating requirements, there will be no further elaboration here. The statement of the plan will give further detail.

Transportation Requirements

Chapter V specifies that transportation to evacuation areas will be accomplished by train and car. Although other forms of transportation are available to some people, it will be assumed that no attempt will be made to make official use of them. The specific problem facing use of cars and trains are dependent upon such factors as the characteristics of the forms of transportation, the evacuation areas, alternate routes, the reception areas, and kinds of problems which could develop, (e.g., competing requirements for the same railroad track). The following outlines the control requirements for each assuming proper execution of the assembly functions.

AUTOMOBILE TRANSPORTATION REQUIREMENTS

1. Examination of evacuation route conditions
2. Introduction of car groups into traffic flow according to plan
3. Adjusting car groups to traffic conditions
4. Readjusting schedule and/or routing for accidents, etc.
5. Coordinating schedule and changes with assembly and relocation operations.

Relocation Requirements

As groups arrive in reception areas, they must be guided and perhaps transported to dispersal points for specific billeting assignments, and then to the billets. In order of their implementation the following lists relocation tasks.

RELOCATION REQUIREMENTS

1. Identification of arriving groups
2. Communication of information about billet location to evacuees
3. Transportation (if necessary) for evacuees arriving by train
4. Redirection of lost evacuees
5. Inspection of billets for under and overloading
6. Inspection of billets for fallout measures and supplies
7. Facilitation of supplies augmentation

A Sketch of a Plan

The plan offered here is partly justified and the rest is arbitrary. Like the rest of Chapter V, it is illustrative and not definitive. The following plan which is constructed around the functions mentioned above, attempts to meet the primary objective, evacuation in seven days, and to a small degree, lesser objectives.

The command and control philosophy is to delegate operating control to the lowest operating levels while retaining only the power to initiate the evacuation at the topmost level. As procedures stand today, the President would have to give the order to evacuate. The specific routing of such an order through DOD offers several possibilities, but in any case the President would probably talk directly to the people regarding the matter.

Actual control of the evacuation probably would not directly involve the federal government. State and certain inter-state organizations would control the evacuation, operating nominally through the governor, but actually through the state Civil Defense Office. The role of regional civil defense personnel would seem to be largely advisory.

The plans, in accordance with the constraints described earlier, are entirely on paper. The plan offered here is formulated using calculations, such as those shown elsewhere in Chapter V (particularly section G). Detailed operating subunit plans are prepared by those who would be called upon to use them in an evacuation. Plans at the lowest levels are made compatible by State Civil Defense officials with the advice of OCD regional personnel in the manner in which some of the state survival plans were prepared.

Planning Operations

The requirements for plan formulation, updating, evaluation, and revision can be met in a variety of ways. To formulate plans, the basic variables of assembly, transportation, and relocation have to be related to obtain a solution which fits at least the basic criterion--finish within seven days.

Evaluation of plan effectiveness - This is accomplished by experts, perhaps aided by some modeling. For many reasons there can be no large scale system evaluation using either simulated and/or live inputs.

Updating - Like many similar functions, this could be expected to have a lag and to be subject to error. Here it will be assumed that relatively permanent changes in parameters have been kept up

to date, but such temporary changes as the closing of a bridge for two months have not been within the task objectives.

Revision - When this results from evaluation, it is a task of small effort, since updating and evaluation as planned here would produce few changes. It is therefore assumed that the plan originally formulated would endure as long as the assumptions regarding the attack remained unchanged, except as changes may seem necessary to the planning in hindsight.

This estimation is carried over to dynamic conditions as well, since, with paper preparations and minimum expense, it would be impossible to recalculate traffic and other problems on a real-time basis. Expert judgment at the scene of unanticipated problems would have to be relied upon.

Plan Distribution to critical groups of personnel associated with command and control would take place before the evacuation. For example, local CD offices, police stations, and other facilities could have copies of the portion of the evacuation plan which pertained to them. Distribution of plans for shelter building and supplies would be given to evacuees arriving in reception areas (See Chapter V, Section E for possible content), and the 10% left in the evacuation area. Plans for home and small business preparation, and for evacuation covering types of transportation, time, assembly instructions, and preparations would be distributed by CD and CD-augmented personnel during the scramble period. Such industries as steel may want to make special preparations.

Assembly

The major subfunctions in assembly of evacuee concern communication of instructions, preparation of transportation, and the timely forming of evacuees into groups commensurate with transportation characteristics. Some less important matters are the reforming of families temporarily separated by conventional workday activities, the optimum use of the period of time before controlled evacuation could begin, and the disposition of persons who could not reasonably return home.

Scramble Period - This plan permits a "scramble period" of about six hours during which transportation, police, civil defense, and other people are prepared for their evacuation duties; and instructions are communicated via TV, radio, and printed instructions are handed out by officials. Families may be reformed and homes and businesses are prepared for temporary abandonment. In addition, persons who are in a position to leave early may begin under their own initiative if they know their assigned reception areas.

The decision to assign individuals to auto or train transportation involves weighing of several factors which relate to a workable solution of the transportation problem. Easiest are the rather few instances in which cars alone are available. The majority of cases would permit a choice. Some factors which would come into play in arriving at a choice of transportation are ownership of a car in good condition, closeness to a railroad station, size of family, location in evacuation area, train scheduling possibilities, ratio of cars to people, and possibly some other factors. To simplify the choices, it might prove adequate to assign everyone in the large metropolitan areas to train transportation who lives within certain distances from railroad loading points. Everyone else would go by car. This approach would leave for resolution only those cases which probably require special attention, anyhow.

Controlled Assembly - After the six-hour period, some trains are available; a preliminary schedule has been established by relating plans to the specifics of the operation; and groups of automobiles are prepared for travel (full tanks, some food, and relocation site supplies). In metropolitan areas, the first people assembled to go by train are those living within walking distance of stations and yards. Later groups residing out of walking range are brought to loading points by buses, and other vehicles. The first car groups assembled to leave are those near entrances to evacuation routes. In area view, the first groups of evacuees by car that need to be formed are those at the outer edge of the evacuation area near entry points.

Assembly of groups is performed by uniformed police and firemen assisted by CD officials who are stationed at railroad loading points and automobile assembly areas such as supermarket parking lots and sections of road. Auto preparations are made at local service stations and garages. Auto inspection is made by assembly area officials. Rejected vehicles are either sent for repair (minor only, e.g., replacing a tire) or returned to home garage. Passengers of vehicles not passing inspection are reassigned to other transportation.

Evacuee group assignments are made by geographical area. This expedient not only makes communication easier, but gives officials a method of checking the credentials of individuals reporting to assembly areas to join groups.

Personnel Augmentation - One of the most significant assets available in an evacuation operation is the millions of man-days of unskilled and skilled labor which could be applied to a variety of tasks. The following is a list of some of the more obvious services which many people could fulfill in support of the assembly

operation. Mustering personnel for duty could probably be done partly through existing organizations such as clubs and churches, and partly through recruitment as the occasion requires.

- Police and fire duties
- Evacuee assembly
- Food, water, medicines, clothes, tools, special equipment
- Gasoline supply
- Instruction on evacuation route
- Train preparation and supplies
- Supplies for the 10% to remain unevacuated
- Shelter preparation for the 10% remaining unevacuated
- Home and business abandonment preparations

Transportation

Auto transportation would be the sole means of mobility for suburban and rural area residents. In large metropolitan areas, like New York and Philadelphia, both cars and trains would be used. Generally speaking auto and train transportation do not compete for the same space, except in rural areas where roads and tracks may cross without an under or overpass. Evacuation routes, major roads, may be assumed to have few competing intersections.

Following the plan alluded to earlier, evacuee groups closest to transportation and to the periphery of evacuation areas leave first. In addition, they go to the more distant reception areas.

Train movements are developed and maintained by railroad dispatchers as outlined in Chapter V, Section D, and Appendix 2. Inter-railroad coordination in scheduling may require a committee of railroad representatives.

Overall responsibility for auto traffic departure schedules is held by State Police. Auto schedules depend in part on population density, preparation time and evacuation route capacity. Earlier groups, presumably from less heavily populated areas, could probably leave when ready without particular regard for movements of competing traffic, since it would be relatively light. Later groups would have to follow a schedule of entry onto evacuation routes in order to avoid unnecessary congestion of roads which would impair traffic movement, and waste time for evacuees in assembly areas.

One way of scheduling auto traffic is to assign specific evacuation routes to areas for periods of time such as four-hour intervals. Time intervals could be allocated so that traffic flow was almost continuous by rotating time intervals through adjacent

areas along the main evacuation routes. Intervals could be assigned from the periphery of the areas to be controlled toward the centers of the evacuation areas and then from the center back to the periphery. In order to account for the varying amount of traffic which could be expected, time intervals could be varied in length or reassigned. Easiest to handle would be a system which evacuated completely beginning at the periphery and moving toward the center, ignoring closely timed schedules. With this system, only the completeness of evacuation need be considered and that only approximately. Control, therefore, would be relatively easy. It is this plan which is offered here.

On the highways, traffic control could be implemented by police stationed at critical points with tow trucks at their disposal. Communication between police could be maintained by squad car transmitters and receivers. CD officials in evacuating areas could maintain telephone communications with officials in assembly areas of evacuation areas to follow. It might even be possible to move vehicles from assembly areas to entry points on evacuation routes. This would permit even closer coordination of the change from one evacuating area to another, and it would reduce the requirement for communication facilities.

As mentioned for the assembly operation, people not actually evacuating could perform various tasks. The following is a list of some tasks associated with support of the transportation operation which could, under the circumstances, be performed by many people.

- Remove disabled cars
- Fuel and supply evacuation route gas stations
- Assist police in traffic direction

Relocation

Using the operating procedures suggested in the plans section, sending large groups of evacuees to the same area, it is likely that reception areas would be inundated by periodic floods of evacuees. To avoid delays, means for making billet assignments necessarily would have to be fast and multiplexed. The method of handling this problem which is suggested here assumes that the primary goal of evacuation is nearly achieved by having evacuees in the reception area. It further assumes that some attention can be paid to another evacuation goal--minimizing personal distress.

One way of assigning billets quickly is to have the assignments made at as many points as possible. Convenient points might be each village and town in reception areas. Larger towns might have two or

more points which we will call dispersal points. An ideal dispersal point for autos would be a large shopping center, fair ground, or some other large parking surface near the billeting area. There, working from lists prepared in advance by local CD officials from such sources as tax records, more distant billets are assigned to early arrivals and closer billets to later arrivals. Cars are brought to the dispersal points by police who redirect numbers of cars from the main evacuation routes in reception areas toward dispersal points. The number of cars to be sent to specific dispersal points can be estimated in advance and corrected according to circumstances.

People in autos could probably make their way from dispersal points to billets with prepared maps which could be marked with specific directions by persons who know the local area.

Evacuees arriving by train might be met by local transportation of almost any description and then distributed to billets. It is assumed, in the Northeast, that trains will be able to come into most billeting centers. Private cars, trucks, and buses could assemble near train unloading areas (stations in most cases) and CD officials could make billeting assignments to queued up evacuees. Billets would be as close to the station as possible so that traffic movement would be minimized and some people could walk to billets. Cars belonging to other evacuees arriving by auto could be pressed into use for transportation too.

Once at the billet, evacuees could assist in the preparation of the facilities for habitation and for fallout protection. It is likely that there would be a surplus of manpower for such jobs as earth-moving and stocking of supplies. A great deal could be done to augment food and shelter supplies using local transportation and supplies, and supplies brought by evacuees. Moreover, some, or perhaps all, of the following could be done:

- Transporting evacuees arriving by train to billets
- Making and stocking shelters
- Keeping roads clear of obstruction (e.g., parked cars)
- Helping officials such as the police and CD
- Preparing hospital facilities
- Making shelter inspections

An Option

The plan sketched above does not mention moving hospital patients, prisoners, and support personnel who may no longer be required for the evacuation as the operation progresses. Neither does it mention moving food to reception areas in a way which might

reflect the degree to which this could be critical. It is suggested that the first matter be handled as an option if the movement of evacuees leaves time. In any event, some of these people, particularly in the support category, could go by car to reception areas after their particular area has been evacuated, using routes which are not used as evacuation arteries if the evacuation is still in full swing, or using evacuation routes if traffic loads and control permit, or by joining groups in nearby assembly areas.

Food movement in significant amounts and appropriate types--non perishable staples--may be a problem which may not be readily solved in a one-week evacuation based upon paper plans. Although some solution is possible, unless adequate preparations are made, food supplies may be the critical factor, limiting the length of time people can stay in evacuation areas. As an option, or possibly as part of a paper plan, food movements may be planned to occur either in conjunction with personnel movements, or following the seven-day period, or both. In addition, evacuees could take non perishable food with them--as space permits.

Evacuation Support Requirements

Equipment

This is obvious for the most part. The only items not generally part of the civilian and Civil Defense resources are the evacuation preparations which, in this instance, are stored plans and instructions, and such food as can be transported to reception areas to supplement local and CD supplies. The plans, as mentioned earlier, are function and task specific and are stored in the facilities of the using group. Plans for assembly, for example, would be maintained by local CD and police in their separate facilities. Each state would prepare command control plans in the number and variety required.

Instructions for shelter-building and evacuation preparations could be made, generally⁽²⁾ without regard to local characteristics. These might be stored locally in CD, municipal, state or federal facilities. The minimum number would be one set of instructions for each family. A safety factor of some dimension might be added--say 50%. This would mean about 20 million of each kind of instruction for the Northeast.

Communications

Within the assumptions bounding this illustrative study, there is no need for equipment in addition to that ordinarily available. It is assumed that communications would not be degraded by the

evacuation operation. Traffic associated with evacuation operations could probably be absorbed due to the surplus in resources generally available, the decrease in certain kinds of use (e.g., business and chit-chat), and the fact that the plan of operation does not require heavy use of communication facilities. Significant amounts of unessential use of communication facilities may require emergency measures such as blocking out phone use from residential areas, either by actions taken at switching facilities or by placing limitations on phone use.

Personnel and Training

Police routinely handle very heavy traffic loads without augmentation. The railroads indicated no augmentation requirements in the Survival Plans. Many support and essential functions (communication, transportation, food supply, etc.) are routinely carried out on a round-the-clock basis. In addition, millions of people are available to carry out many of the less skilled tasks associated with the evacuation. It would appear likely that adequate numbers of people were available for most tasks. However, one minor problem might be the preparation of home and business for abandonment, such as leaving doors unlocked, windows closed and shades drawn. For example, it might take heating specialists to direct the shutting down of boilers and furnaces so that damage would not result. Even this possibility could be handled, however, in the time available, assuming that adequate support people would remain for work if requested.

The plan sketched here uses people in relatively familiar roles, maximizing transfer of existing skills. Rather little training would be needed under these circumstances. This could be handled by communication media and by specialists on the scene. For example, train crews traveling unfamiliar routes might be supplied with printed instructions which describe the route and useful responses to contingencies. In addition, one or more experienced men could be made crew members.

FOOTNOTES TO SECTION H

1. It is understood that these terms refer to directions in which to emphasize these design considerations, and that realistic application is necessary.
2. See Chapter V, Section D.4.2 for an example of an important exception.

Section I. Arguments Pro and Con EvacuationIntroduction

There are many arguments for and against evacuation. Some of them are presented in this section. Each one concerns a particular characteristic of evacuation. They tend not to delineate the interrelation between different aspects of the subject. This would be much more complicated. The arguments are usually treated in the following way: given an argument such as "Accelerates the Arms Race," the first few paragraphs expound the reasons why evacuation can in fact accelerate the arms race; these first comments involve the basic notions embodied in the title; a few statements of rebuttal then try to put the argument in perspective or attempt to deny it completely. If necessary the discussion goes back and forth between the more sophisticated arguments on both sides. Finally more detached comments on an argument may follow in a final paragraph.

The arguments for and against evacuation are of many different types. Some arguments are concerned with the effects of purchasing or securing the evacuation. An argument that the "national debate over purchasing the capability is not worth it" is an example. Other arguments are directed toward the effects of having the capability. For example, Type II deterrence is improved by the simple existence of this capability since it makes a first strike more credible. Finally, some arguments involve the effects of using the evacuation. Arguments maintaining that evacuation will not work for some reason are concerned with the use of evacuation. It is worthwhile to keep this distinction in mind in reading the arguments since it structures the debate.

Some comments seem appropriate concerning the way in which the controversy could be further structured. Evacuation should be viewed as an important part of national policy. As one specifies a national policy some of the arguments for or against evacuation become more or less relevant. In extreme cases, arguments may become completely irrelevant. The argument that evacuation is immoral because it makes a first strike credible is rejected if one assumes that policy calls for a "not incredible first strike" posture. If that is national policy, immorality of this type is no longer an issue. If, on the other hand, minimum deterrence becomes our chosen posture, then the argument gains in relevance and persuasiveness since the issue remains open.

Probably it is not possible to decide whether evacuation is or is not desirable without specifying other aspects of national strategy. Certainly elements of domestic and military policy are closely related to it. However, it is also unlikely that an evacuation capability can be decided upon simply by specifying national strategy in sufficient detail. The subject is just too complicated and controversial for that. Nevertheless a discussion of strategic evacuation would be strengthened by presenting a national policy context.

A more complete discussion of the basic arguments and their role in a national policy would still omit another range of questions. These questions involve additional issues which a President might pose. He would be concerned with publicity, priorities, lead time, practical politics, the chances of success and failure of an operation and similar matters.

These more detailed discussions and the relations between strategic evacuation and national policy will be taken up in other Hudson Institute Reports. We have contented ourselves here with a statement of certain basic arguments which we feel obligated to recognize in this illustrative study on evacuation.

1.1 Arguments for Evacuation

1. Insurance in Very Tense Situations
2. Irresponsible, Desperate, and Gambling Decision-makers
3. Guide Spontaneous Evacuations
4. Chinese ("small nuclear power") Wars
5. Type II Deterrence
6. Improved Bargaining Position Pre and/or Post Attack
7. Exploit the Present U.S. - S.U. Strategic Situation
8. Match or Deter a Possible Soviet Evacuation
9. Technological Breakthrough
10. Reassure Allies on NATO Strategy
11. Lengthen and Stabilize Escalation Ladder
12. Protect Against Bizarre Situations Involving City Vulnerability

1. Insurance in Very Tense Situations

If a person advocated an evacuation capability because he expected that at some future time an American President would see fit to firmly repulse the threat of a powerful adversary, whether or not the capability existed, one could argue that he was advocating evacuation as insurance. This position should be contrasted with one which argues that the capability permits the President to take the same position by enabling him to cut expected losses. One must understand this distinction before he can formulate an argument for evacuation as insurance, since insurance is not usually thought of as changing the risks of the situation insured against. The insurance argument is clearly an argument for buying an evacuation capability in order to be able to use it (if necessary). It runs like this.

It is true that an evacuation capability may not protect all lives or even, in some contingencies, many lives. But if saving more lives is better than saving fewer, the fact that no absolute protection exists should not deter one from buying as much insurance as seems reasonably effective for a wide range of possibilities.

Even though the insurance may be available, the risks to be insured against may be too slight to be worth the cost. If one argued that a general war ran a better than 10% probability of happening in the next 30 years, many people would consider this argument very cautious and optimistic. The risks certainly seem appreciable to most people.

The cost of this insurance might vary from about \$.25 per person for paper plans to \$5.00 per person for moderate preparations and \$100.00 per person for extensive preparations. It seems unlikely that no amount of money above \$.25 is an appropriate premium to provide unproved protection against the possible dangers and the unforeseen developments of a rapidly changing military and political situation. This cost (for paper plans) is not even a yearly premium, although some updating of plans, requiring additional funds, may be necessary from time to time.

Some feelings against evacuation as insurance anticipate a future period in missile development that would make preparation less and less desirable as insurance against a launched attack. Paradoxically, these same developments in the arms race, by making general wars more risky and destructive, increase the possibility that a general war will not start except in a tense period of crisis escalation. Such a period provides warning time not available in past city evacuations. Former preparations assumed a surprise attack "out of the blue." This represented a form of going to war for positive gain since one assumes no desperation or arguments were visible to justify the attack. To the extent that this situation is unlikely, and nearly all analysts think it is, then insurance at least exists for a wide range of the most probable ways the general war might start.

A popular rebuttal to the insurance argument asserts that evacuation would increase the risks of war and therefore cannot be considered analogous to insurance. Unlike a tactical evacuation, strategic evacuation plans would move some of the population a week in advance of a date at which a war might start. Much can happen in that time and the location of our population can be expected to influence considerably the decisions of both sides. Our decision to launch a war and an enemy decision to pre-empt could certainly be affected by an evacuation. It is also argued that the insurance may not be very good and that better protection is afforded the population by keeping people where they are and threatening retaliation against enemy cities. This would certainly eliminate a period of transit during which large fractions of the population would be highly vulnerable.

Of course, it can still be argued that an evacuation capability would provide insurance against those situations in which a war in the near future might seem certain and an enemy would seem capable of attacking or threatening to attack populations. There is no doubt that the

probability of such clear foreknowledge and such terrible enemies must be weighed along with the possibility of increasing the risks of war and the temporary vulnerability of the population. Whether or not an evacuated population is significantly better off than an unevacuated population when faced with a malevolent enemy who attacks people wherever they are is also at issue.

2. Irresponsible, Desperate, and Gambling Decision-Makers

What if a national leader should arise who shows great determination, perhaps in a deranged state, and such evil intentions that almost any kind of war would seem preferable to surrender or to the terms of his ultimatum? Some say that Hitler was not quite the threat that this indicates. They do not regard him as insane. He was nevertheless capable of plans to wipe out all Jews and Gypsies. One cannot rule out the possibility of being confronted again with such a tyrant. In 1930, Hitler was relatively unknown but by 1939 he was issuing ultimatums to Czechoslovakia. In the last ten years the Soviet Union has seen Stalin, Malenkov, Bulganin and Khrushchev at the helm and some believe that Beria came close to seizing control. This range of personalities over periods which are historically very short gives one pause. One-man rule can lead to control by senile or paranoid men, as may have been the case with the aging Stalin. The determination of very hard men in manipulating risks of war may be increased by the desperation of their population, as may be the case in a hungry China, or even by the fear of losing their position. If one believes that "absolute power corrupts absolutely," one is inclined to regard the possibilities of war threatening ultimatums rather soberly. Hitler's attitude toward Germany losing a war was that honor demanded that every German die fighting. Such an approach by rulers of a nuclear armed state could dictate the most drastic domestic efforts to make fighting the war feasible. Thus, this argument might more aptly be entitled "preserving the feasibility of war" if situations become desperate enough. Evacuation contributes to this.

A reply to this approach often takes the following form. Of course, it is possible to imagine very terrible, desperate circumstances but they may not be very likely and, in any case, some risks must be run because all eventualities cannot be protected against. Leaders who attempt to run terrible risks tend to be removed and one would expect this to be increasingly the case in an era of fast-acting retaliation. Many countries will never want anything badly enough to run great risks and if they do, probably their demands should be met or compromised.

A more sophisticated argument for evacuation would perhaps assume that the best way to discourage such leaders from arising and to encourage their overthrow would be to maintain an evacuation capability and thus to indicate limits beyond which it would be unwise to push us. Thus having an evacuation capability would tend to deter outrageous acts and threats.

What probability should be assigned to the development of desperate circumstances is difficult to estimate. How much warning may be given by the approach of such situations is also not predictable. Such are some of the issues raised by this argument.

3. Guide Spontaneous Evacuations

In September 1938, during the Munich crisis, a substantial number of people spontaneously evacuated London. They feared an outbreak of war and a dreaded large-scale aerial bombardment. Many expected the Berlin crisis of 1958 and 1961 to result in similar spontaneous movements of people from cities. In general, if one believes that spontaneous evacuations will occur when war seems imminent, it would appear highly desirable to guide these evacuations rather than allow them to proceed chaotically. If evacuations might become massive with increased tensions, the reasons for advance plans might include:

1. Minimizing domestic tensions and strains associated with evacuation;
2. Being in a position to encourage or discourage the evacuation;
3. Lengthening the period during which the population can remain evacuated;
4. Minimizing the costs of the evacuation.

In short, all the reasoning that would go into paper plans and the expenses associated with other preparations should make guidance worthwhile even if an ordered evacuation may not be likely. Hence the expenses would seem justified if one anticipates the possibility of an evacuation under any circumstances.

One could counter this argument by claiming that it is somewhat misleading when it assumes that preparations for an evacuation would be of assistance in guiding or preventing a spontaneous evacuation. This may not be the case in general and certainly with respect to many individual preparations it is not. For example, if an evacuation should begin spontaneously with people taking refuge with their relatives in the country, plans which tell them where to go may be of little use in guiding the movement. At the same time these plans may not be designed to slow or prevent evacuations. It can also be argued that under present conditions people would not be impelled by fear, foresight, or determination to evacuate a week in advance of a war in sufficient numbers to cause a real problem. While this certainly depends on the character of the crisis, the likelihood of spontaneous evacuations is certainly open to speculation, and hence to a consideration of evacuation plans for such contingencies.

4. Chinese ("small" nuclear power) Wars

In an argument for evacuation there is not too much lost in discussing China as the prototype of a "small" nuclear power. This is because China appears to have other characteristics that would make an evacuation capability seem desirable for us. We have little experience in adapting our strategy in this age to the weapons around which our defense is built. We have even less experience in solving the strategic problems associated with countries which are "small" nuclear powers. If the leadership of these countries show any one of great determination, inscrutability, differences in values, willingness to lose lives, or desperation born of a starving population coupled with the ability to destroy five or ten American cities we may find the situation difficult to cope with. Are we willing to destroy or threaten to destroy millions of Chinese lives in an effort to deter an attack on five or ten of our cities? An evacuation against a "small" nuclear power has the purpose of preventing deterrence from becoming a two-way street. It should permit a strong enough bargaining position against a small power to resolve the dispute without war.

One can argue that this discussion is oversimplified. The Chinese are not likely to quickly develop missiles with great invulnerability or to be able to position them with great secrecy. Our ability to preempt and destroy their power will be significant especially with some air defenses to protect against the few missiles that may be missed in an attack. Also the Chinese inability to carry the war through to a successful conclusion will tend to deter them from actually firing their missiles.

On a more sophisticated level of argument, however, a few missiles can get fired and some might get through. A President might feel better about taking a chance or standing firm with an evacuation capability. Moreover, the small countries which become armed may be very irresponsible even in comparison with the Chinese. A new era may simply require certain possibilities for protective action against many different possible adversaries and one of these methods may be evacuation.

This discussion rests heavily on the possibilities of nuclear diffusion. In turn, this problem involves considerations of arms control, U.S. and U.S.S.R. policy toward allies, the rate of technological development, and other considerations. Whether or not the argument seems persuasive now, it should be clear that a future era in which it will seem very good has a significant probability.

5. Type II Deterrence

Type II Deterrence is the deterrence of major provocation by threats of strategic retaliation. This kind of deterrence is improved by the existence of an evacuation capability which will make more credible the

possibility that the threats will be carried out. Without an evacuation capability, and with certain types of opponents, a crisis may find the President unwilling to make the threats, much less carry them out. Evacuation provides a story which makes Type II deterrence at least a sensible posture on paper and possibly does much more.

A rebuttal to this argument must maintain that the assistance which evacuation gives to Type II Deterrence is weakened by other aspects of evacuation. The evacuation may not seem likely to work or it may weaken resolve by a national debate or lead to threats of unlimited warfare by an adversary and so on. In particular, if evacuation is effective in making our threats more credible, it should for some images of Russian strategy, by that very measure, be a strong argument for Soviet increases in missile production.

A more sophisticated version of the Type II Deterrence argument maintains that the strengthening of the possibility of making and carrying out strategic threats influences a President's resolve on lower rungs of the escalation ladder. If evacuation is one way, no matter how remote, of dealing with large crises, there will be an additional possibility of formness in any less serious situations. It should act against the possibility of appeasement induced by a feeling that all will be destroyed if resistance remains and escalation continues.

This last argument bypasses the arms race considerations of the cruder form by emphasizing the President's perception of the possibility of evacuation rather than the adversary's view. However, by doing so it raises the specter of miscalculation by suggesting a situation in which the President stands firm with evacuation in mind and the adversary, not so conscious of the possibility, forces him to mutually unanticipated and undesirable forms of escalation.

An important example of a future possible extreme provocation would be isolated attacks on cities, leading to tit-for-tat trade of cities. The aftereffects associated with reaching such high and peculiar rungs of the escalation ladder might be very serious. A serious arms race would probably ensue and the situation might lead to great tension over prolonged periods of time. An evacuation might forestall such peculiar actions by indicating a desire to have the war or settle the matter without war at that time. In other words, one simultaneously makes a maximum effort to show resolve and also clears the decks for a nuclear war. It is very difficult to discuss such a bizarre situation without being more concrete but it should be clear that controlled retaliation could seem a very dubious way to settle such a terribly serious crisis.

6. Improve Bargaining Position Pre and/or Post Attack

A pre-attack goes like this. If the people are in the cities, it is hard to imagine an American President initiating a war against an enemy with a second strike capability sufficient to attack 10 cities with nuclear weapons. This difficulty of credibility puts the country in a poor position in negotiating. It simply is a fact that after provocation has occurred there will be many compelling reasons to say, "Deterrence has failed in this case, let's forget about the matter under dispute." For example, if one wanted a Soviet Army to give up 200 miles of West German territory into which it had just advanced, one anticipates a degree of determination on the part of the Russians which does not collapse by unbacked and incredible threats. An evacuation seems to have some possibility of introducing a new element of sufficient strength to make a reversal possible.

A post-attack bargaining argument might be as follows. A counter-force-plus-avoidance strategy which seems to be becoming American policy must weigh very carefully the implications of leaving people in the cities. Typically such a strategy leaves a few missiles and planes undestroyed in enemy territory because they are new cities, or generally because the attack is not "all out," or because enemy secrecy prevents their destruction. This attack requires offering a peace treaty with the concessions appropriate to a partially armed adversary. Naturally, the degree of armament does not determine the concessions so much as the destruction which those arms might wreak. A few bombs are a terrible threat to an unevacuated population. Five bombs could effectively destroy New York, Philadelphia, Washington, Chicago, and Los Angeles. This is such a small number that it is very difficult to know that an enemy cannot really deliver them. Since a partially disarmed enemy is a very determined and desperate one, it seems clear that demands for concessions will be very heavily weighed if no evacuation occurs.

One can question these arguments by asking whether the bargaining position attained by evacuation or threats to evacuate does not have some exploitable weaknesses. For example, pre-attack threats to evacuate by their very seriousness might cause the public to support appeasement. Once the evacuation is completed, the President's position is very susceptible to an adversary's stalling. The evacuation cannot be held indefinitely and pressures for compromise arise. An adversary's understanding or misreading of the pressures from the public for an agreement may cause complications.

On the other hand, these considerations can all be restated to appear as advantages. After all, from the psychological point of view before an attack, the evacuation has shown great resolve. An expensive and very difficult move for a politician has been undertaken. The fact that the President might be impeached by an angry public even if he wins substantial gains, may not hurt his position in negotiation but may

strengthen it. He must show some gains and all know it. The fact that the evacuation is very difficult to repeat or prolong puts time pressure on the adversary, also, who should fear abrupt action from us.

In part, this discussion presupposes notions of controlled war and post-war bargaining which may or may not be either possible or present policy. It also assumes a significant improvement in population protection after evacuation. This is probably most significantly an improvement against small second strike capability unless the evacuation is into prepared shelters.

7. Exploit the Present U.S. - S.U. Strategic Situation

There is reason to believe that the Soviet Union is in the process of trying to match a counterforce strategy of ours with a minimum deterrence position. This may be for reasons of economy, doctrinal lag, trust in our restraint, an inclination not to make major provocations, a hesitancy to indulge in an expensive or hopeless arms race, a belief in the efficacy of secrecy, or for some other reasons. In any case, this may represent a mistake on their part. A situation might occur, through breaches of secrecy, or such incidents as the U-2 plane, or for other reasons where a major provocation would entail very little risk and insufficient moral difficulties for a U.S. decision-maker. An attack on Europe, for example, which showed signs of succeeding might make a President feel that carrying out our commitments with a counterforce-plus-avoidance strategy was not only a humane course (compared to massive retaliation) but one involving little risk. The risk might never seem small, however, if a few bombs could destroy our leading cities. With evacuation, the situation might appear very different. In a desperate situation with active defenses, an era of unreliable missiles, vulnerable control centers, and a great imbalance of power, one might argue that very few bombs, if any, would make up a second strike if the first strike were large and accurately directed. With evacuation, these few bombs might cause little population damage. There are, of course, technical considerations with many uncertainties. These uncertainties alone, without the overwhelming moral considerations, would require a desperate situation before an American President would act in the face of them. Nevertheless, these situations could arise and evacuation could make the difference.

This argument presupposes many technical considerations and a U.S. national strategy of counterforce and not-incredible first strike. It could fail on either count in any particular time period. Some of the dangers involved in this kind of exploitation of strategic imbalance are dealt with in other arguments such as "Accelerate the Arms Race." However, it should be clear that the very force of this argument tends to make the purchase of an evacuation capability a readily perceived threat in the S.U. If evacuation is a sound move against a minimum deterrence posture, then minimum deterrence is threatened by evacuation.

8. Match or Deter a Possible Soviet Evacuation

For many people the desire to have an evacuation capability is most easily justified by hypothesizing a Soviet evacuation. Such an evacuation would be a very threatening gesture when coupled with an ultimatum. The most credible reply short of a pre-emptive war would be an evacuation of our own. Without considerable planning, our own evacuation might take too long or be too unstable for even quick negotiations. If our population could only remain evacuated a week while the S.U. had prepared to remain evacuated for several months, our difficulties would be obvious and real and would affect the Government's position. Also our evacuation capability might deter the Russians from trying to evacuate.

It can be argued in reply that Soviet evacuation is very unlikely. To evacuate in a position of strategic inferiority and in a minimum deterrence posture has many drawbacks. First, the population may not be significantly better off if our force is overwhelming; and second, the military forces do not have the power to end the crisis since they are designed to retaliate and are generally too weak. This means there is no possibility of our being struck first and we can wait out the evacuation.

However, if the Soviets conducted an evacuation for the purpose of temporarily improving their position while Europe was occupied, they might be able to achieve their ends with inferior weapons. On the other hand, this kind of brinksmanship is very stark and possibly very unlikely. Soviet planners would be forced to consider many short and long term American replies and these alone, without an evacuation capability, might deter them.

Basically the "match or deter" argument requires a judgment concerning the likelihood of such serious Soviet provocations. This likelihood could increase during the next few years if our strategic superiority is reduced as a consequence of either the arms race or some varieties of arms control. Some information on Soviet evacuation preparations would also be very appropriate.

9. Technological Breakthrough

As discussed in point 7, the present U.S. - S.U. strategic situation may make evacuation a crucial element. In a future situation with greater destructive power on both sides, evacuation might be similarly crucial in combination with a technological breakthrough in active defense. In general, these advances would probably not make city inhabitation safe enough to be desirable no matter how good they were. On the other hand, they might be sufficiently successful to protect a large part of an evacuated population. This aspect of possible technological progress provides one argument for evacuation.

Looking at technology from another point of view, it is conceivable that a breakthrough on the part of the S.U. could lead to a deterioration of the international situation. Overconfidence (or appropriate confidence for that matter) in some new offensive or defensive gadget might lead the S.U. to ultimatums and threats of a very drastic kind. In a short crisis period it is difficult to imagine a move which improves our situation so much as a well prepared evacuation.

On the other hand, these two arguments on technological breakthroughs both tend to put more faith in technology than many would think warranted. Neither the Soviet Union nor we are likely to draw suddenly ahead in a short time as a result of a single invention or set of breakthroughs. The time required for an innovation to be developed and to become operational is normally measured in years. Still, speaking on a more sophisticated level, breakthrough can make a difference. Soviet statements that they can "knock down a fly in space" certainly play a role in international affairs.

These arguments call for a judgment concerning the likelihood of a destabilizing technological breakthrough just as a previous argument called for a judgment on the likelihood of a desperate adversary.

10. Reassure Allies on NATO Strategy

One of the crucial questions of concern to our allies is summed up in the question "How many American casualties would an American President anticipate and still come to the aid of Europe?" Whatever this number is, an evacuation makes it harder for an enemy to kill people and this makes it more likely that Europe can depend upon us. Besides this fact, our recognition of it and our acts to make the possibility of evacuation come alive are very much the currency of diplomatic reassurance. In many ways evacuation preparations might be more suitable in tense periods when evacuation seems a possibility since our allies will need our support in those periods. On the other hand, plans can be updated ostentatiously, for example, by passing out new instructions, and further preparations are always desirable.

It can also be argued that Europeans will consider the evacuation preparations a sign of American panic and a too great willingness to have a war which America might survive but which Europe might not. This would not be reassuring. On the other hand there should be some logic to our story that we will come to Europe's aid. Without even a small possibility of our surviving a thermonuclear war our promises cannot be believed. Only our confidence in survival may be necessary to make them believable and an evacuation capability may provide this whether or not it will work.

11. Lengthen and Stabilize Escalation Ladder

In the military realm of active defense the Polaris submarine excited immediate favorable notice for its ability to stay submerged and invulnerable. In this way retaliation tended not to be necessarily "instant." One could wait before replying, ascertain all the circumstances and avoid all the risks associated with "trigger happiness." In crises, this possibility also induced favorable expectations of mutual restraint which reduced the possibilities of inadvertent war. It can be argued that evacuation plays a similar role. If one believes that cities may be attacked there is a tendency, in order to protect civilians, to fire first and heavily. After all, a Polaris submarine firing a week later will not save New York. If, however, a President has made plans to evacuate, it is fair to expect that an enemy who does not pre-empt may have his fears of surprise attack allayed during the evacuation period. This means that a negotiating period of a few days to a week may occur in which the opponent is under steadily increasing time pressure but under little destabilizing expectation of immediate attack. This is a favorable negotiating environment for ourselves. At the same time, speaking more neutrally, war has been postponed for a period of time. No matter how short this period, it tends to prevent actions in anger and to encourage "moments of truth." Once the evacuation has been completed the probability of war is high but there is not the tendency for pre-emption that accrues to extreme vulnerability. In general then, something of a "stabilizing" nature has been placed between other rungs of the escalation ladder and the general way.

The nature of the stabilizing influence of evacuation is actually more dubious than the above argument would indicate. The importance of surprise in modern war may lead to a strike on the day the evacuation begins. This would be the most unlikely time to strike for the side evacuating and for that reason one which might be preferred by it. Also the extent to which the existence of an intermediate step between peace and war affects the chance that a President will act in anger can be exaggerated. Nevertheless, there are probably some effects which make war after evacuation less likely. Some of these appear in the "After Evacuation, What?" argument in which it is maintained that the war becomes impossible to start after an evacuation and that evacuation is therefore undesirable.

These arguments require an attempt to decide how evacuation will look to a President. Will he see it as a ruse to make surprise attack more likely? Or will he see it as an alternative to surrender or nuclear holocaust which improves his bargaining position? Finally, will he view the evacuation as an effort to reduce the vulnerability of the population so as to permit negotiation without reciprocal fears of surprise attack and other inducements to a first strike? The nature of the stabilization depends on an answer to these questions.

12. Protect Against Bizarre Situations
Involving City Vulnerability

Evacuation is such a natural idea that a person might simply argue that "it must be good for something." In an age of fast changing technology and terribly large explosives the fact that our people are clustered together in cities seems to cry out for some alternative to putting what one wants to protect in such easily attacked conglomerations. It is hard to believe that no situation exists in which evacuation might be desirable. In order to bring this point home one might consider certain bizarre possibilities to show that unusual ones do exist.

At present, a very common situation has been occurring for years in high schools. An anonymous voice calls up the principal and announces that a bomb is in the school. It is 99 to 1 that a student wants the excitement of a trip outdoors. No one ever takes any chances. The schools are emptied and a search instituted. What would be the situation if the school could not be emptied? Imagine now a situation in which a small group representing an nth country claims to have stored a suitcase bomb in New York City. It is left to the reader's imagination what the group demands or threatens. It is not clear what answer exists besides emptying the city. If several cities are threatened or if one is not told which of 5 or 10 or 50 are involved, what choice exists besides evacuation and a search?

As another possibility, what happens if the commander of a Russian "Polaris" submarine goes mad and for a short time threatens our cities? Alternatively, armed and preset satellites might be sent up and get out of control.

Of course, it is hard to put in proper perspective an argument which admittedly discusses bizarre possibilities. If the evacuation preparations cost nothing and did no harm one could not be against them. Since this is not the case, one points out that the probability associated with the bizarre possibilities may be very low. Secondly, evacuation may not be the answer to all these threats. For example, if submarines can stay under water indefinitely and continue to threaten us, evacuation may fail to be a suitable reply.

This Bizarre Situations argument is clearly not a central one for the discussion.

1.2 Arguments Against Evacuation

1. Increases Risks of Immediate General War
2. Upsets Tacit Understanding
3. Accelerates the Arms Race
4. Starts a Burrowing Race
5. After Evacuation, What?
6. Neutralization is Credible
7. Can Be Duplicated by Adversary
8. Immoral
9. National Debate Over Capability is Not Worth It
10. Evacuation Itself Will Weaken the Government Position
11. Cannot Be Repeated
12. Encourages U.S. Aggressiveness
13. Inconsistent with Efforts to Reach Agreement on Arms Controls and Other Measures
14. It Is Not Feasible

1. Increases Risks of Immediate General War

An evacuation increases the risks of war in several ways. First, it represents an escalation of the crisis to a much higher level, from which descent is harder. Second, it cannot be held indefinitely and therefore puts a sort of deadline on the solution of the crisis. Third, it decreases the hesitancy of the evacuating power to go to war, since its expectation of losses is lower. Fourth, it creates mutually reinforcing fears of a first strike. Fifth, it encourages the evacuating leadership to refuse compromise, since gains are necessary to justify the expenses of evacuation. Sixth, it encourages the destruction of the empty cities.

To increase the risk of war is not to play a game of probabilities. In some sense, the manipulation of these risks is equivalent to killing people. Though many disagree, moral distinctions between killing a million people and taking a 50% chance of killing 2 million may be hard to draw. When the risks become very substantial, one must consider them a terrible loss to both sides to be avoided at great cost.

Escalation of the risks of war is provocative in a fashion similar to political aggressions across bloc "boundaries." If our national posture is not to be one of "roll-back" we must consider very seriously whether we wish to be this provocative in the bargaining realm. If both sides act in aggressive, destabilizing ways, war seems certain. It is not difficult to imagine a week long evacuation playing the role that mobilization of armies played in World War I. In a similar way it could start a process toward war that will seem in retrospect to have been inevitable from the initial evacuation order.

Of course, if war has not started in a crisis, there may be reason to believe that the adversary does not want to strike first. If the evacuation is done slowly and combined with reasonable offers, the fear that we are about to strike first may be abated. The fact that our empty cities could be destroyed is already some "protection" for an enemy who might otherwise fear our attack since we still would not get off scot free. If the evacuation deters the adversary or induces him to back down, it will have decreased the risks of war.

On the other hand the risk of pre-emption is always there. Evacuation is only done in desperate times and after great provocation. This provocation is not likely to come from powers which do not have the power to strike first if sufficiently afraid of an attack. Also, the desperation which can fairly be attributed to the situation means that our property is not very likely to be considered by an adversary as adequate protection against surprise attack. In desperate times adversaries may have the right to expect desperate action, and hence war. After all, it is willingness to fight a war which we are trying to communicate in this action if, as argued above, we do not fear a first strike.

2. Upsets Tacit Understanding

The balance of terror refers to the terror associated with the threat of killing millions of people. If peace in fact rests upon this fear then evacuation is possibly the most destabilizing move possible. If, in bygone time, an exchange of hostages were followed by one side snatching back his hostage, the other might well expect the worst. The very ritual of exchanging hostages would be in danger from such action and the possibility of an immediate outbreak of violence would be very substantially increased.

While the cities which play the role of hostages were never actually exchanged, their vulnerability to each side has been increasingly evident. Meanwhile doctrines of open cities and military wars have been evolving to regularize their status. In time, and possibly already, these notions are firmly enough understood by military and political leaders of both sides to make city avoidance possible. Possibly threats to attack cities are already deterred by sufficient armament to destroy adversary cities on second strike. In such a case little reason exists for evacuation.

Furthermore, the tacit understanding concerning cities is enhanced and made more easily attained by the prominence and size of modern cities. An evacuation tends to make the distinction between military and civilians harder to maintain. Where in fact the distinction can be maintained, by evacuating away from military targets, the lack of "obviousness" and the need for information associated

with the new population distributions are not so well known and they make agreement on avoiding them difficult to reach. During the war it may be difficult to tell if the enemy is avoiding population or not and how "hard" he is trying. This is already a difficulty worth investigation.

The upsetting of a tacit understanding makes agreement harder to reach on other understandings and represents a setback in efforts to resolve the arms race in the only safe way, through mutual understandings. This particular understanding is fundamental to many others. It seems to represent a decision to try to "beat" the arms race and to "win" or be in a position to do so, when advancing technology should make it clear that this avenue leads eventually to a blind alley. After an evacuation, a certain understanding that general thermonuclear war was unthinkable will have evaporated, even if the crisis is satisfactorily resolved.

It can be argued in reply that, although the first evacuation will in one sense break a tacit understanding, the situation will unfortunately be serious enough to call for it. All-out attacks on citizens could still be deterred by threats of reprisals and in many ways these threats are more credible since a very easily recognized effort must be made by an enemy to destroy an evacuated populace. Also, at the desperate time that evacuation will be under consideration, the effect on others of breaking this tacit understanding may be small. Finally, an open city notion can be depended upon to such an extent that we may withhold from making plans for the possibility that cities might be attacked or threatened.

On the other hand, there are tacit understandings in even the most general war concerning the use of bacteriological weapons and other means of mass destruction. Evacuation can tempt the use of such methods. There are also tacit understandings associated with the purchase and ownership of an evacuation capability. Can our purchase lead to anything less than similar increased efforts on the part of an adversary? Gradually the barriers to evacuation will be dismantled as tacit understandings are destroyed and a very great obstacle to the launching of a deliberate war will have been given up. The threat of reprisal should be deterrent enough to attacks and threats.

There are several questions highlighted by this discussion. These are: 1) whether or not an understanding exists or can be enforced to avoid cities in a war; 2) whether or not an understanding exists or could be maintained to limit evacuation preparations and whether this is desirable; and 3) whether threats to evacuate by our side would provoke threats of unlimited warfare by the other. The answers to these questions will probably determine an attitude toward this argument.

3. Accelerates the Arms Race

Evacuation is a method of reducing the expected casualties of a thermonuclear war to levels which permit the United States to consider war feasible in sufficiently desperate circumstances. This cannot be done against a first strike from the S.U. at the present levels of armament. Therefore the evacuation must be backed up by a threat to strike first and the evacuation must make a second strike "acceptable." It should be one of the first orders of business of the Soviet Union to spoil such computations by increasing their second strike capability.

When Khrushchev explodes very large bombs, some see it as an attempt to manipulate the shelter controversy and Free World attitudes toward the possibility of protection. If the controversy over shelters has encouraged the S.U. to develop very large bombs, if only for publicity purposes, it is probably to our disadvantage. Even if evacuation cannot be expected to be reliable enough to influence preparation for it, Soviet planners may want to be absolutely sure that we do not think this a practical way out of a future situation. A large over-kill capacity with one method or another tends to be the only thing that provides great certainty against adversary miscalculation. It would seem especially likely during years of real crisis that an adversary would make these attempts to improve his position.

We should remember that accelerations of the arms race cannot be undone. Threats to use certain kinds of warfare cannot be retracted. Missiles once constructed are not easily dismantled. We should try not to initiate measures which, against S.U. preferred strategies, mainly increase the speed of the arms race.

In rebuttal to these arguments, the following points can be made. Many evacuation preparations might be done in such a way as to show that they are designed simply for insurance. In general, evacuation is not so reliable as to warrant enemy expectations that we consider it a desirable process. The S.U. cannot afford to make threats of unlimited warfare or to carry them out, since we are stronger. Possibly the S.U. just doesn't act this way. In any case, anti-evacuation methods of destruction such as bacteriological warfare will continue to be looked into independently of this decision.

On the other hand, the evacuations under discussion do not allow a clear distinction between evacuation as insurance and evacuation as a deterrent or improvement in the bargaining situation. People start evacuating a week or so before a possible war. No war is clearly inevitable while such time remains. Therefore, the evacuation and the evacuation preparations and purchases are justly susceptible of an aggressive interpretation. Any nation which is desperate and losing or simply witnessing another nation prepare to be "one up" may decide to make threats of unlimited warfare or to buy more missiles. Carrying

them out is a different story but, once they are made, attempts to make them credible will follow and the likelihood of their being carried out will be increased. In fact the S.U. may be responsive to our postures and moods and may be more interested in methods of allaying our self-confidence than in objective questions concerned with future war outcomes. Trying to build "self-confidence" by purchasing evacuation preparations may simply ask for accelerations of the arms race which will maintain our vulnerability. It is pretty clear that any evacuation can be made pointless with weapons which could be purchased by ourselves or the Soviet Union in the next ten years.

The gist of this argument on accelerating the arms race centers around the likelihood that an evacuation will be countered by CBR warfare and the chance that it will encourage an increase in Soviet missile production. In judging the latter argument, one might compare the effect on the S.U. of two different threats. In the first case we announce our intention of fighting counterforce and retaining the ability to strike their cities. In the second we buy a large evacuation capability. Both of these actions are very threatening against a minimum deterrence posture. In some way, however, the second may be even more threatening. The first notion threatens the Soviet posture by trying to make their threat of retaliation unusable because their cities are hostages. This threat can never be completely relied upon since it requires enemy rationality. However the evacuation preparations put us in a position to strike which is theoretically dependent only on our willingness to evacuate. These preparations also tend to require and reinforce a counterforce targeting strategy so that they combine the two threats in one.

4. Starts a Burrowing Race

If evacuation is effective, or thought to be so, or even if mutual expectations are generated which make it a token in bargaining encounters, a race to exceed in this dimension may ensue. General of the Army Omar Bradley once stated that attempts to conquer China would require turning our country into an armed camp for 150 years and he suggested that this would represent a loss for us. In this way a race to put our people, our schools, our stores, and our factories underground may result in the loss of many of those values and aspects of life for which we are struggling. This is what continued efforts to maintain an evacuation capability may lead to.

The question is whether we can expect to be unchallenged in this "race." It seems unlikely that this will be so. Efforts to match each other in other realms often involve considerably more trivial aspects of the Cold War. If in fact this race will become a two or more party race, will any advantage of a military nature result from it and will it accrue to us? A second argument maintains that evacuation may involve a burrowing race against increases in technology as measured by either the first or second strike capabilities of the S.U. for destroying population.

One can argue in reply that it is important to consider short and long term problems. If an evacuation of some type or evacuation preparations of a certain magnitude seem to promise significant increases in safety or in deterrence, short run considerations may dominate. In any case, very simple measures provide a great deal of protection and do not necessarily lead to great efforts at burrowing. On both sides the costs and undesirability of such efforts may tend to deter them. However, it can also be said of thermonuclear weapons that they are expensive and not desirable of themselves. Nevertheless, the logic of national security easily produces an arms race in them. A burrowing race which is primarily defensive rather than offensive, designed to save your citizens rather than to kill his, would seem, a priori, much easier to start and maintain. Therefore, the restraints to a burrowing race may be more fragile than one would suppose and evacuation may provoke one.

In summary, part of the burrowing race argument is certainly correct. If evacuation is to provide real protection against enemy population attacks, the degree of money and effort put into evacuation plans must increase with technology as measured by the first strike capability of the S.U. and probably by the S.U. second strike capability. Whether or not our efforts to maintain an evacuation capability will lead to S.U. efforts along similar lines is another matter. It is also not clear whether an attempt to maintain our capacity to evacuate will lead to wider attempts to disperse and protect. In some ways, this last argument is in agreement with the "Encourages More Fundamental and Permanent Dispersals" argument, but it has an opposite point of view.

5. After Evacuation, What?

This argument affirms that evacuation is a snare and a delusion. A snare because it will seem to be a reasonable alternative in a desperate situation. A delusion because it will not improve the situation and will lead into a blind alley.

Consider a decision-maker in a desperate situation. This man might be, like our President, a man reputed not to have suffered more than one or two losses in his career. He has tended to win and is not used to losing. Assume great national values and interests are at stake in this crisis. Both sides have persisted through intense crises such as we never hope to see in our lifetime. Possibly controlled reprisal has taken place. The alternative of evacuation is broached to the President. It is a chance to "win" without war. It is expensive and politically difficult but it puts off the moment of decision. The latter moment involves giving orders which, in an unparalleled way, will result in instant destruction of millions of innocent people. It seems clear that evacuation would be ordered if the most cursory plans existed indicating that it had a possibility of

success. Once the evacuation is ordered, the risks to both sides are greater. (See argument on Increase Risks of General War.) It becomes even harder for the decision-maker to back down. Costs have been accrued. His order to evacuate has indicated that he is not "in control" of the situation and that anything might happen. This is not a desirable political position. The adversary may evacuate also or show no signs of weakening resolve. At best he may stall. Caving in completely seems unlikely for a power which has shown such persistence in climbing the escalation ladder. Against stalling defense is difficult. The evacuation cannot be held forever. International negotiations involving guarantees are involved in ending it. These guarantees must be born out of fear and be strong enough to guarantee a country's survival. How are they achieved quickly? What if the adversary is not completely anxious to help? If one suspects stalling or is sure of it, but the crisis has de-escalated somewhat, how can the decision be made to launch a first strike? Although it is now recognized that massive retaliation got what credibility it achieved from a subconscious assumption that decision-makers would act in anger, it is not yet perceived sufficiently that the evacuation may have similar problems. An evacuation does not put off a decision to start a war, it may make it impossible. Here lies the delusion. The immediate threat to justify the decision is removed. This is in itself a good thing but if the evacuation is very unstable, the decision-maker finds himself in a trap. Eventually he must attack in cold blood or allow a return to cities without satisfactory negotiations. The first seems completely unsatisfactory and the second leads to a hardening of the adversary's position and a very tense situation with no small possibility of re-evacuation.

In rebuttal, one could argue that the above position is necessarily an argument for tying the President's hands. One must assume that if evacuation will be a trap, it will be recognized by the appropriate decision-makers. Possibly it is not proper to say that the capability should not be bought because the decision-maker will fail to envisage all possibilities and will fall into a trap. The evacuation plans will make clear the costs and hazards. Also stalling is dangerous for the adversary and therefore may not occur. The instability of the evacuated population does not involve a fixed deadline so that our threats may be strengthened by the time pressure without our being really committed to carrying them out at any fixed time. In fact there may be clear cut situations where stalling cannot be a useful tactic. There may also be situations in which the United States intends to strike first, hopes to complete the evacuation first, and believes that the Soviet Union cannot pre-empt.

On the other hand, the extent to which evacuation is a trap is a fair argument to make against purchasing it since it reduces the contingencies in which it would be objectively desirable and thus weakens the arguments that say evacuation is worthwhile. In considering the possibility that the adversary will stall it is plausible to assume

that the great provocations which make evacuation worth considering arise only from either determined, self-confident, heavily armed, or desperate governments who have decided to gamble. Whether or not they plan to back down when challenged, it is not unreasonable to suppose that they will hit upon the notion of stalling when faced with the prospect of retreat and when they realize, as we should assume they will, that stalling is perhaps their best reply. Meanwhile, the civilian outcries and the perhaps tenuous political position which the evacuation may lead to for the President, could induce the adversary to see weakness in our position.

The discussion of "Snare and Delusion" rests on two points. First, evacuation is likely to be used if it is available. Second, it will fail when used because it leads to a position which can neither be maintained nor, in the absence of new provocation, ended without war. While the first argument is an attempt to "lock in" the President in some sense, it is supported by the strength of the second argument. One must judge the chance of a serious crisis occurring without our side being clear on the guarantees which we want to end the crisis or our willingness to go to war within the evacuation period if things do not go well.

6. Neutralization is Credible

For a country with as much power and secrecy as the S.U. it seems clear that threats to neutralize the bargaining advantage associated with evacuation are credible. What this means in plain language is that if they said they could kill everyone anyway, evacuated or not, we would believe it, especially if time had gone by after evacuation became an issue. This argument differs from arguments concerning an acceleration of the arms race. Whether or not the arms race is, in fact, accelerated we may be so unsure of the advantage to be gained by evacuation as to be deterred.

Also, in real life, neither we nor the S.U. may really know whether or not the threats are correct. The neutralization may occur through uncertainties. Widespread use of bacteriological warfare may be more difficult than laboratory experiments indicate (some say they indicate substantial difficulty already). The threats to use bacteriological warfare are a loss to all concerned. Just as war preparations used to be the necessary (some would also say the sufficient) condition for war, violence threats and violent actions are becoming necessary conditions for war in our time. It may be as important now to try to discourage threats of unlimited warfare as it was then to watch war preparations carefully. If the threats are called for and credible, they may be issued.

A reply might be that, although the Soviet Union is very powerful it will not be able, for some time, to retaliate with sufficient force to destroy an evacuated population with nuclear weapons. Its threats to do so by bacteriological methods and other means involve serious

risks for it and may not be impressive because of our belief that these means are too difficult to carry out. Also such threats invite similar ones from the U.S.

On the other hand, even if one believes that neutralization is not so immediately credible and requires at present threats to widen the scope of a war, it is hard to argue that great amounts of money and effort are necessary to make a particular evacuation futile or to discourage it greatly. Larger and larger bombs might be developed and the megatonnage divertable to population attacks might be devoted to areas named in advance, such as the Northeast. What would be the effect of a Soviet intimation that an evacuation would result in the death of all inhabitants of the states in OCDM regions 1 and 2? This threat and labeling of targets if believed would produce a significant neutralization of the evacuation with a minimum number of weapons.

The argument that neutralization is credible is similar in its crucial elements to those involved in the "Accelerate the Arms Race" argument. The point of view is different since that discussion makes the point that an acceleration of the arms race is undesirable while this one emphasizes the weakness of evacuation when confronted with such arms race considerations. Probably a central question which one should pose is whether strategic evacuation as described in the one-week plan in Chapter V will look as inadequate ten years from now as tactical evacuation looks today. This is possibly a good beginning from which to consider the probable lifetime of an evacuation plan and the difficulty of neutralizing it.

7. Can Be Duplicated by Adversary

If escalation is necessary, one should look for actions which, although they produce risks and added fears, produce them in greater quantity for the other side. Escalation which seems to represent a simple matching of will without strategy is as poor strategy as the endless recruitment and mobilization of ever larger armies was in past times. The idea that we can simply show "more resolve" and they won't be willing to "follow the leader" is dubious. It is much easier to be second in a measure than first. The man who is second and "sees" the bid shows a natural and unprovocative instinct which does not show signs that can be read as indicating a desire for instant war. The man who goes first does not indicate by his action any intention not to go further and he therefore induces great fears and takes risks. In general it seems safe to expect that if all other things are nearly equal (and a long escalation tends to prove them so) the final rungs of the escalation ladder will not determine the winner by his pure resolve alone. He must exploit some objective situation. The Soviet Union differs but does not differ very substantially in its number of cities and distribution of population--the difference is large to demographer but not to a leader feeling responsibility for the protection of urban populations. What can we expect in reply to our

evacuation if not a Soviet evacuation? After this, both sides are somehow much nearer war but neither is significantly safer than if they had agreed on an open city convention.

A reply to this might be that we do not fear the duplication of our evacuation or of our preparations except to the extent that the latter induce us to greater preparations (burrowing race). If both populations are evacuated everyone is better off since a war, if it occurs, will be less likely to destroy people.

However, if both sides do evacuate and neither is willing to go to war or back down, it is not clear how the situation can end. As with other rungs of the escalation ladder, stalemate produces an urge to move on to other rungs, in this case, war. The duplication argument asserts that one should be dubious about evacuation if the motive is to show more resolve and thereby avoid war.

8. Immoral

Our government has or should have purchased thermonuclear weapons only to deter war and not to fight one. Evacuation is a method of putting oneself in a position to threaten and to carry out a first strike. It is not moral to use our weapons to threaten or to carry out a first strike against tens of millions of people with little association or responsibility for the adversary government.

Further, to the extent that evacuation is a prelude to a very destructive war, it represents a plan for making first strike feasible at the cost of many American lives. This "save the wife" and "lose the child" attitude does not represent a rational or moral defense plan except under such immediate expectations of attack that no week or even 24 hour evacuation is feasible.

A response to this argument would be that the first strike threatened would not be indiscriminate and massive under present policy. The lives threatened would be nearer millions than tens of millions. Evacuation is intended for suitably desperate circumstances in which U.S. interests are threatened which are actually vital and where the adversary must back down. The existence of such vital interests may make desperate choices and strategic warning possible simultaneously. And finally it may be wrong not to try to protect tens of millions of our own citizens if outbreak of war appears imminent.

On the other hand, efforts to hold an enemy's population at thermonuclear gun point while yours is being removed to make other threats stronger seems especially reprehensible since it manipulates mass murder for political purposes. No vital interests except immediate survival can justify such a thing. One must insist at least on seeing actual moves being made to attack us before striking and this rules out strategic evacuation.

9. National Debate Over Capability Is Not Worth It

In England before World War II, Civil Defense preparations were made in secret because many elements in the population were against war preparation. It should be clear after the shelter controversy that there are substantial losses to be considered in starting national debate over certain life and death issues. In California during this controversy, citizens bought weapons, argued over their rights and duties to shoot neighbors who might overload their shelters, and considered the hostility shown by Nevadans who threatened to patrol their border after an attack. Most shelter advocates did not predict the force of this effect. In some sense we denied our national existence in an every man for himself approach to civil defense.

It can be argued that evacuation preparations are not of this type. Citizens are not put on their own, except perhaps to stock goods. Arguments are not necessary in every hamlet to decide and determine the degree of compliance with Government suggestions. On the other hand there must be and will be considerable discussion. Evacuation areas must be stocked. Persons must again discuss and consider the means and methods of saving their lives. Will some expenditures help their position? Who must stay? What are the chances of family separation? Will the survivors envy the dead sufficiently to make the effort worthwhile? Is the danger so great that these preparations must be made now? Is the action immoral? Will all the anti-shelter arguments seem even more appropriate to evacuation, producing a "last-straw" effect and resulting in national divisions of a critical kind? It is not only politicians who must gauge the effects of national debate for "selfish" political motive. There are real fears that, in a calm enough time, the debate may do more harm than the existing need for capability is worth.

The "National Debate" argument supposes a certain degree of public knowledge of evacuation preparations. How much public knowledge is required for different degrees of preparation is not clear. Certain things can be done in secret or in unpublicized ways. On the other hand, the spending of a billion dollars would undoubtedly require public hearings and lead to a considerable amount of public discussion.

10. Evacuation Itself Will Weaken The Government Position

In tense periods many citizens will oppose preparations for war. The ultimate preparation, in some sense, is the evacuation itself and many people may refuse to be evacuated. Those who do evacuate may be a great force for accomodation. If many people have remained in cities, the evacuation may be too incomplete to have the positive aspects desired of it while the arguments against it may apply very well. The risks of war, the threats to neutralize, the removal of tacit understandings, etc. may all have occurred without positive benefits. Even if the government finds itself in a position to ignore public opinion during a crisis, it may find it impossible after the crisis. The governments of France and England found themselves so shaken by the risks run in earlier Hitler Era crises as to inhibit them from involvement in later ones. Successful resistance in May, 1938 may have led in this way to Munich. How much more likely is this to be the attitude of the average citizen? What long run effects can be expected if national resolve suddenly disappears because it had a close call? At present many are willing to risk war over Berlin although they recognize that war will be very destructive and very likely result in their death. Could such an attitude continue after the notions making it up are really brought home? If these arguments have validity then the losses associated with an evacuation and no war are sizable. If one tried to argue for evacuation simply as a prelude to certain war, then the evacuation concept would seem a good deal less desirable.

This argument includes two possibilities. One is that the evacuation will weaken our position in the short run through its inability to evacuate everyone or its effect on those evacuated. Second it is anticipated that the end of the crisis will find the population considerably less willing to escalate again. The latter point especially should be considered carefully. If a policy has a chance of leading to war and a chance of attaining peace but is likely to be undesirable in the long run even if peace is achieved, it could seem very dubious.

11. Cannot be Repeated

For the reasons stated above (Evacuation itself will weaken Government position) and because the risks of war increase with repetition, the possibility that an evacuation can be undertaken for a second time within a short period is small. What role should be attached to a one shot measure that does not result in complete conquest for one side and complete surrender for another? Assuming that neither of these possibilities does occur, negotiations must continue and the possibility of evacuation has

been removed from them. For example if the evacuation brings concessions and negotiations and then is ended, an adversary might retract and harden his position without fear of a new evacuation. One can argue that it is better to preserve evacuation as an ever present threat than ever to undertake it. After all, the threat is understood, while the undertaking involves many risks and arguments. The S.U. knows that we would do drastic things if the situation got desperate enough and evacuation is one of them. If they don't know it, we could tell them. In any case, doing it is not really necessary and even preparation for it is not absolutely necessary to increase its credibility. If we should prepare to evacuate and then not do it, our seriousness will be called into question and the credibility of an evacuation weakened.

Second, since the evacuation cannot be repeated, it is an inferior in this respect to more stable measures. We would not buy a single shot rifle if we expected a long war. A one shot evacuation in the expectation of a long twilight struggle may be no better.

A reply to this argument might be that the situations in which evacuation is contemplated are so serious that they justify a one shot measure and do not happen very often. Whether the same crisis will require this evacuation is another matter. Without knowing exactly how the crisis was handled, how successful the evacuation was, the public reaction to it, it may be impossible to say exactly how difficult a repetition would be. In World War II, some cities saw as many as four different phases as evacuations increased and decreased with changes in the ferocity of city attacks. This may or may not be relevant. In any case, the importance which should be attached to the possibility of repetition and the likelihood of a successful repetition are the central points to consider.

12. Encourages U.S. Aggressiveness

An evacuation capability, once bought, is more or less permanent. The plan may not be updated, but it exists and could always be tried. No matter how stable the government, the cold war and small hot ones will put strains on it. If we were to lose several South American countries in pro-Communist parties, the aggressive minorities in this country might become very large. Leaders might be produced who said, "If they do one more provocation, we should hit them," and these provocations might be poorly delineated. There might be strong impulses to war in a short

time. An evacuation capability seems to make this "hard" policy more likely. One might question whether we would feel safe with this policy in the possession of leaders who are not yet chosen in situations of tension not yet imagined.

It can be maintained that this is an argument to be looked into by the decision-makers. In some sense this is correct, although the same point can be made about some arguments for any military procurement policy which buys less than everything. Military equipment can always be misused. There are some capabilities which are just too dangerous in the modern world. An automatic doomsday machine is such a capability. An ability to evacuate could, in some circumstances, be part of an equally dangerous policy.

13. Inconsistent With Efforts to Reach Agreement on Arms Controls and Other Measures

Can a country prepare both for war and for peace? Can a person remain tentative and determined in efforts directed to two different contingencies? If one believes that imbalances can occur and that self-fulfilling prophecies exist, one is tempted to emphasize preparations for peace, least preparations for war get out of hand. If we believe in stalemate and arms control, we should act in a consistent fashion. At very least, evacuation will increase Soviet suspicion. For example, if evacuation will spur on the arms race or make us less vulnerable to the Russians in crises, our chances of getting them to give up their secrecy may evaporate. In tense periods, mutually reinforcing fears may be still further reinforced beyond the capability of our tenuous agreements to withstand. The expectation of such strains may make agreement difficult. Agreement based on the assumption that cities on both sides are hostages may no longer be possible. In a crisis will Khrushchev believe Kennedy over a phone if a) our population is in cities or b) our population is evacuated? Trust will not bridge the latter gap though it may suffice in the former situation. The open city agreement is discussed in "Upsets Tacit Understanding" but it represents another important example of a growing agreement which could be strangled by evacuation. Agreement and understanding are difficult enough without divisive influences.

In reply some would say that peace through arms control may be a "pipe dream" and that agreements are generally not much. The Soviet attitude toward secrecy may make it impossible to reach the agreements anyway. Finally agreements should not be based on trust or rely heavily upon our not creating Soviet suspicions of the kind created by evacuation.

To the extent that evacuation does interfere with certain tacit and overt understanding a choice between the two should be consciously made. For planners this is probably the central point of the argument. For decision-makers the argument indicates a direction in which more detailed discussions should go.

14. It Is Not Feasible

The notion of evacuation can fail to be feasible in several ways. First the movement of 100 million people is an enormous operation. Computations concerning the rates at which masses of people will move are likely to be very uncertain. Preparations to ensure the availability of food for the total population during a transition, shelter and post-war period are enormous. People may not be willing to move. Command and control problems may be extremely difficult. If a war occurred innumerable problems might arise afterwards even if the people survived in their shelters. The destruction of wild life, many trees, and insects might give rise to ecological difficulties. The number of people saved in proportion to resources could result in starvation when coupled with agricultural difficulties. Since the evacuation cannot be tested in any reasonable way, it may not be a scheme worth putting enough reliance upon to try. We should keep in mind the fact that we will never be sure that it is necessary and that it is provocative and risky.

A reply to this argument would be that the longer one looked at the paper plans the better they seemed. Individually the uncertainties associated with all of these complaints can be made manageable with sufficient time, money and effort. Still the operation is large, and coupled with unknown post-war problems the movement may have been a waste of time, especially against certain kinds and quantities of weapons.

It can be maintained that a facade would be sufficient for many of the purposes for which evacuation is desired. For example, the fact that neither we nor the S.U. could ever be absolutely clear that evacuation would not work might be sufficient for its support of type II deterrence. On the other hand it may be a bad policy to buy facades when the possibility of using them with disastrous results is not ruled out.

APPENDIX ASome World War II Examples of Evacuation

This investigation of the evacuation experiences of World War II was undertaken in an attempt to illuminate the problems of evacuation of personnel from urban areas under threat of imminent attack. Though this study is cursory and brief we believe that it will serve the function of providing some perspective since many of the problems discussed still have meaning for us today. However, it is not the intention of this paper to prove that evacuation can "work" in event of a nuclear attack, nor is it within the province of this short history to deal with the difficult question of the strategic implications of evacuation in the cold war.

British Evacuation

In 1919, the British Government issued a statement proclaiming that no major war was likely to occur for ten years; this assumption was official policy until 1928. Consequently, defense preparations in Great Britain were held back. (1) Terence O'Brien, the official government historian of Civil Defense in Great Britain during World War II, maintained that:

Still suffering from the exhaustion, material and moral, of the 1914-1918 ordeal, the people were most reluctant to believe in the probability of another world-wide catastrophe. Planning for air raid precautions thus lacked the public support it might otherwise have received--until the catastrophe was imminent. (2)

The government, as well as the population, was reluctant to think about the possibility of fighting another world war. Those few who were concerned about potential problems of civil defense were hesitant about educating the public. There was no popular vehicle which the civil defense proponents could harness to carry the problems of civil defense to the people. In 1928, some saw in the Kellogg-Briand Pact the end of the use of violence to settle national differences. Those who were more sceptical concluded that the best means to present civil defense facts to the public was by a gradual and deliberate approach.

However, the mood changed in the early 1930's as the press, radio, and cinema demonstrated the menace of air power to the nation. And men of such stature as Stanley Baldwin shocked the people by asserting that:

...the bomber will always get through...I think it well also for the man in the street to realize that there is no power on earth that can protect him from being bombed.(3)

H. G. Wells produced a movie, "The Shape of Things to Come," depicting the barbarism Britain would be prey to in a post-war world--the collapse of government and the destruction of their modern industrial society. The reaction was a shutting out of bad news--war and/or preparations for war were unthinkable.

In a report published by the Air Raid Defense League in June of 1939 it was estimated that if 200 bombers per day, each carrying $1\frac{1}{2}$ tons of bombs, would drop 3,000 tons of bombs in 10 days, such raiding might cause at least 200,000 casualties in congested districts. The government officials were no more optimistic that the man on the street regarding the peoples chances to survive during a bomb attack; in fact, they determined his expectations. Though Churchill himself did not underestimate the threat of air attack he characteristically demanded that the government face problems realistically.

We must expect that, under the pressure of continuous air attack upon London, at least three or four million people would be driven out into the open country around the metropolis. This vast mass of human beings, numerically far larger than any armies which have been fed and moved in war, without shelter and without food, without sanitation and without special provisions for the maintenance of order, would confront the Government of the day with an administrative problem of the first magnitude, and could certainly absorb the energies of our small army and our Territorial Force. (4)

But he concluded:

Problems of this kind have never been faced before, and although there is no need to exaggerate them, neither on the other hand, is there any need to shrink from facing the immense, unprecedented difficulties which they involve. (5)

In 1935, even after Mr. Baldwin accounted that he had been "completely wrong" in underestimating Germany's potential air strength, the peace groups refused to heed the exhortations of the "war mongers." The British Chiefs of Staff asserted that this peace propaganda (the League of Nations Union obtained over 11,500,000 signatures for a "peace ballot") had deterred the government from taking steps to rectify the advantages the Germans had achieved in building a modern war machine.

The British government, fearing the consequences of a civil defense debate, continued to formulate plans behind closed doors. Hence those who argued that a mature civil defense program could never be introduced unless the public's cooperation was enlisted, and who asserted that Parliament would not legislate the necessary funds unless a public debate compelled them to take such action, argued in vain.

On the continent, however, in Russia, France, Germany, and Czechoslovakia, civil defense precautions became general knowledge and in some cases, civil defense exercises were carried out in public. (6)

In parliament, members of the opposition fought against civil defense planning. They considered such planning evidence that the government's efforts to work for peace were not sincere. Several members of the opposition made such an accusation in 1935, when the Home Office issued its first circular on Air Raid Precautions (ARP), which predicted that the scale of air attack in the next war would far exceed anything experienced previously, and that it would be "impossible to guarantee immunity from attack."

However, in 1938, a number of MP's who had observed the Spanish Civil War first-hand, asserted that in light of the Spanish experience provisions for shelters and arrangements for evacuations from the most vulnerable areas were of primary importance for passive defense, outweighing all other civil defense measures. In July of that year, the Anderson Committee, formed to look into the problems of evacuation in Great Britain, reported (as paraphrased by a Scottish report):

Evacuation of civil population during time of war was an urgent task as air strikes would henceforth take place on a scale much greater than the air raids during 1914-18. Even if civilians were not primary targets, persons living in industrial areas would be in great danger, as docks, public utilities, and factories would be hit. Therefore, an exodus from the urban areas would ensue on a scale which would not be predicted. The government was under an obligation to take measures to control the flight of the city populace. (7)

One result of the Anderson Report (which was not made public until after the Munich Crisis) was the inference that in the event of evacuation the reception centers would be overcrowded and hygienic problems would occur. It was therefore decided that the Ministry of Health would be given responsibility for the scheme. However, since the Board of Education was to play a vital role in the evacuation of school children, and since a

precise delegation of authority was not made explicit, the Board of Education and the Ministry of Health were in direct competition. To complicate matters further, the local authorities who were to be responsible for the welfare of the evacuees in the reception centers were not thoroughly briefed on their obligations and duties in the event of evacuation.

The Fabian Society criticized the report, stating that:

In discussing administration it suggested that evacuation should be controlled by local authority, but it did not say whether these authorities should be the country or district; ...and as to the classes of persons who should be evacuated it was utterly vague. (8)

From the beginning, the question of command and control posed a massive problem to the government. The decentralized political structure of the country exacerbated this problem. Regional Commissioners were to be responsible for passive defense if war broke out, yet their powers were defined in general terms only. The Commissioners were to act as representatives of His Majesty's Government in their regions, and in the case of emergency they were licensed to assume powers beyond those "officially" entrusted to them; that is, they were to assume a personal, executive responsibility, and their actions would be supported by the government. To aid them in their duties, Chief Constables, recruited from the local police, were assigned similar executive privileges.

During the Munich Crisis preparations for civil defense were undertaken in secrecy. The Chief Constables were to take executive control of Air Raid Precaution measures; yet secrecy requirements prevented their consulting the local officials and ARP organizers who had been, up to this point, in charge of the program. Since the definition of duties was general and vague, administrative difficulties arose. (For instance, no provisions had been made to consult technical personnel, such as medical men or engineers.) The Fabians charged that the government put the burden of responsibility for evacuation in the hands of local governments which were ill-equipped to deal with the problems. (9)

In 1938, prior to the Munich Crisis, the Anderson Committee recommended that evacuation should not be compulsory unless military or other special considerations deemed it necessary; that a certain number of persons should be evacuated from the industrial areas, both for their protection and to prevent their utilizing resources that might contribute to the war effort; that the reception of such persons should be mainly on the basis of accommodation in private houses under powers of compulsory

billeting; that the initial cost of evacuation should be funded by the government but, where possible, the refugees should contribute to their costs; and that school children should be sent to the country in groups, under the guidance of their teachers. (10)

Great emphasis was put upon the evacuation of the refugees; reception was considered less important. This may be accounted for by the theory of "the knockout blow." Many students of air power during the period from 1918 to 1935 believed that it would be possible for the aggressor in a war to deal the defending European nation a knockout blow through a surprise air attack on its major cities. So widely-believed was this theory that in the crisis period of 1938 the British people were expected to fear the worst. Consequently, contingency planners in government maintained that in a future war the exodus of the city population from the urban areas in Great Britain would be a massive, unruly flight. The Anderson Committee recommended that the army assist the public authorities in mitigating such chaos in the event of a crisis. Furthermore, in 1938 a group of eminent psychiatrists from hospitals and clinics asserted that during the first month of air attack, "psychiatric casualties" would outnumber physical casualties three to one, i.e., the three to four million persons would suffer panic, and other psychological impairment during the first few weeks after attack. (Meanwhile Mira, a Spanish Professor of Psychiatry, stated that in Barcelona there was no marked increase in acute psychoses or neuroses during the Civil War, and that hysteria and severe anxiety states were rare; and in fact the British did overestimate the incidence of both physical and psychiatric casualties. (12)) A program based on these pessimistic assumptions was to be carried out in the Munich Crisis of September of 1938, while a more sophisticated version was in operation in 1939. (13)

Munich Crisis

On the 24th of September, 1938, when it was announced that Chamberlain had failed to reach an accommodation with Hitler, the Civil Defense authorities in Great Britain immediately instructed local ARP groups throughout the Isles to issue gas masks, dig trenches, and prepare first aid posts. For the man in the street, these Civil Defense procedures were the first visible, personal proof of the gravity of the international situation. However, the population was unprepared to respond to the threat and to prepare to meet the problems that would arise. Local authorities were hesitant about pursuing an evacuation scheme that might prove to be unpopular with their constituents.

The public, used to hearing their leaders speak confidently about appeasement and desperately hoping they would not be called on to fight again, were far from being psychologically prepared for war. Organization of ARP had been confronted by general reluctance to think of war as a possibility. Progress had been hampered by local refusal or inability to incur expenditure and a central procedure geared to an ample period of preparation. The news of Mr. Chamberlain's flight to Berchtesgaden gave the public the first indication that peace was gravely threatened, and air attack much more than a remote disaster. (14)

Political considerations arose which complicated Civil Defense planning and preparations. The government failed to issue gas masks to the population before September in fear of provoking the Nazis. (15) The pacifists contributed an articulate opposition to Civil Defense and war preparations of any kind. Severe unemployment contributed to the workers' receptiveness to the following Communist line: the capitalists were preparing to wage another war for their own aggrandizement, while the outcome of the war would be decided by the working classes of Europe; indeed, the munitions makers would not suffer the carnage of global war but would reap the rewards of war production. (However, the Communists did not advocate refusal to fight until after the Molotov-Ribbentrop pact of 1939.)

Others who contributed to the literature of that period proclaimed the Versailles Treaty unjust. A war waged against the Germans, who were suffering under the structures of the Treaty, would be a criminal act detrimental to the spirit of the democracies. (See C.E.M. Joad's "Why War," in which he chides those who would go to war in the name of the Versailles Treaty. In the same work he takes Lord Baldwin to task for advocating conscription:

"Should I be putting it too impolitely if I were to say that to stand up to Nazism means, in the long run, adopting Nazi methods? I do not think so." (16))

Civil defense was viewed by many of these same people as just another element of war preparation.

The proponents of civil defense in Great Britain, aware of the need for educating the public to passive defense measures, were constrained by the political pressure which the peace groups and their allies could mount in opposition to a civil defense program. The secrecy of the civil defense planners resulted in local officials remaining uninformed of the civil defense program

until the Munich Crisis was upon them. Thus they were not in a position to introduce passive defense measures in their communities until the international situation has become critical.

During the Munich Crisis there was a substantial exodus of urbanites from London. The roads were packed with cars and the railroad stations were overflowing. The exact number of persons who actually did evacuate London is unknown. The government failed to take measures to lessen the confusion and did not issue an evacuation order until the 29th of September, when the worst of the crisis was over. (17)

The crisis did, however, make two contributions to the civil defense program. It provided a valuable practical test of the evacuation scheme (which proved to be inadequate), and it encouraged the people to work with the government in a more determined, cooperative effort toward an improved evacuation program.

Yet the behavior of those who fled the city during the Munich Crisis did not ameliorate the fears of the government. The flight of a great number of people from London was thought indicative of what might occur on a larger scale in the event of an actual attack on the city.

Post-Crisis Preparations

After the Munich Crisis, the Government decided that any evacuation scheme would be restricted to specific groups. Priority classes were defined as: First, school children accompanied by their teachers; second, infants and young children accompanied by their mothers; third, expectant mothers; and fourth, adults who were blind, crippled, or similarly incapacitated. (18)

It was the government's contention that if people in these classes could be moved in an organized fashion, it would be possible to avoid some of the confusion that would surely accompany another crisis. Since in this plan evacuation remained voluntary, the government was faced with the difficulty of preparing for the evacuation of an undetermined number of persons. Thus, transportation and communication channels might well be overloaded in some areas while in others they would not be fully utilized. Voluntary evacuation provided the government with many imponderables. Nevertheless, the planners decided that the uncertainties of the voluntary scheme were preferable to the animosity that would be engendered by a compulsory evacuation.

It was predicted that, under threat of air attack, 83% of those in eligible categories (approximately 4,000,000 persons) would be evacuated from the large cities to the countryside of Britain.

The First Evacuation

In the early hours of September 1, 1939, the evacuation program was put into operation, and in three days, 1,473,000 persons were removed from the large cities under government guidance and control.* The children, accompanied by their mothers, met at their schools and went through the final process of activating their registration. The teachers, with some mothers assisting, then led the children to the railroad stations where they boarded awaiting trains. (Infants were accompanied by their mothers on the trains.) The evacuees were told to carry food for the journey.

Local authorities and volunteers met the evacuees at reception centers and assigned them to their respective quarters. (19) Dispersal of the nation's food supply throughout the country was one of the emergency measures carried out when Britain entered the war in September. At the same time the nation was partitioned into twelve regions and Regional Controllers were appointed to carry on the duties of government should Whitehall and Westminster be destroyed. (20) The entire operation was carried out before war was declared on September 3, and it was completed without a single major accident or casualty that could be attributed to the evacuation. (21)

Two million people evacuated the English urban areas through private means. They made their own arrangements for transportation, food and shelter. The government did not establish their precise number until the fifth year of the war.

Some of the school children who had registered for government evacuation actually were removed privately and some never left the cities at all; thus the official number of evacuees was considerably lower than had been expected. It was difficult for the government to explain what determined the decision to leave and what accounted for the choice of mode of evacuation. Why were 50% of London's school children evacuated, while in Glasgow 42% left as opposed to 15% in Sheffield and 22% in Nottingham.

* See appendix, p. 14

When the actual moment of decision came, many parents preferred to expose their children to the dangers of the bombs rather than to break up their families and suffer separation. In cases where mothers were to accompany their infants and leave their husbands behind, an even larger proportion refused. Subsequent studies suggest that it was as important for the emotional stability of the parents to be with their children as it was for the children to be with their parents. (23)

The fact that many persons who had registered for government evacuation actually left by private means resulted in the need for extensive changes in train schedules and produced confusion at the reception centers. The experience in Great Britain demonstrated that the more efficient the preparations, the larger the number of persons who followed through on government evacuation. Thus in Manchester, which had provided its citizens a highly precise evacuation scheme, 79% of the people were actually evacuated as planned.

NUMBER OF EVACUEES (24)

	<u>London & Metro. Areas</u>	<u>Other evac. Areas</u>	<u>Scotland</u>	<u>Total</u>
1. Unaccompanied school children	393,000	371,200	62,059*	826,959
2. Mothers and accompanied children	257,000	169,000	97,170	523,670
3. Expectant mothers	5,600	6,700	405	12,705
4. Blind persons, etc.	2,440	2,830	1,787	7,057
5. Teachers and helpers	89,355		13,645	<u>103,000</u>
				1,473,391

* Though Titmuss (24) does not explicitly say so, we must assume that those mothers in Scotland who accompanied the 62,059 "unaccompanied school children" to the reception centers returned home afterwards, while those mothers who accompanied their 97,170 children to the centers remained there with them.

After the refugees reached their destinations, the problem became one of human relationships. Mothers and children who had fled the cities to take up residence in the English countryside found themselves not only in foreign environs but in close contact with persons of very different social backgrounds; indeed, differences of economic status, social class and styles of life provoked much discontent. Yet in general the evacuees and their hosts adjusted without any really serious effects.

While separated from their families, the evacuees were plagued by economic uncertainty; many came to feel that it would be easier to contend with the certain danger of the bombs; than with the uncertainty of economic penury and the anxiety of a fragmented household. The direct cause of a widespread return to the cities was the delay in German air raids on the British Isles; London was not bombed until the fall of 1940. By the end of 1939, evacuees were returning to their homes in great numbers. 900,000 left the reception centers while only 570,000 stayed behind. (25)

Political Repercussions:

Months after the first evacuation, but before any Nazi raids, anti-civil defense proponents launched a campaign. They argued that the latter was overcautious and created greater difficulties than the threat warranted. Many were angered by war precautions, the breaking up of families, rationing, and the general disruption of city life. Practically every aspect of the Civil Defense scheme came under attack and the program was held responsible for inconveniences it did not provoke. (26) Some critics charged that the "British Government suddenly and without previous propaganda was in part 'nationalizing' hundreds of thousands of women as effectively as even the Russians had done", and prophesied a revolt. (27)

Meanwhile, in the reception areas, the animosity which resulted from crowded conditions was growing in magnitude. The discomforts of those who had fled to the crowded country-side contributed to the anxieties of the Civil Defense officials.

It was feared that the desire to "spend Christmas at home" would destroy the evacuation scheme once and for all. Rising public expenditures and spiralling inflation now led the government to consider discarding the evacuation scheme, but the operation was continued.

The Second Evacuation

The evacuation scheme remained a government civil defense measure. In the spring and early summer of 1940, 300,000 persons deemed it wise, because of the deterioration of the situation on the continent, to move further inland. In the fall of 1940 when London was bombed, a second great exodus ensued. Approximately 1,250,000 people were evacuated between 1940 and 1942. (28)

In the second evacuation there was no mass exodus of refugees to the hinterland; rather the movement was characterized by a small but steady daily stream of evacuees. Indeed, since many parents who had experienced the hardships of the first evacuation now refused to send their children away, the government considered means to compel the recalcitrant to comply with the evacuation "request". Even though an order under a "Defense Regulation" was proffered, the idea of compulsion was excluded from government policy. Therefore many of those who had fled the unrealized threat of 1939 and returned, refused to escape from the real dangers of 1940.

During the second period of evacuation, the Government improvised a program known as the "assisted private evacuation" plan which provided "billeting certificates" and free travel vouchers for those who found their own accommodations. Mothers with children of school age or under, expectant mothers and the aged and infirm came within the scope of the plan. Thus the program of finding habitable quarters in the reception areas was reduced. An evacuee could now be reimbursed if he found his own accommodations in dwellings of his own preference. Housing had become increasingly scarce since the war began and the plan filled a necessary gap; i.e., the government's funding the project gave eligible persons a greater incentive to evacuate and find housing of their own. Thus the government's obligation to supply housing was somewhat ameliorated and the number of persons who were assisted by this scheme in one form or another amounted to 1,250,000. (29)

The fact that the assisted private evacuation program was successful created an unexpected difficulty. Since people were finding for themselves the government lost the power to control their movements. It became apparent that evacuees were competing with war workers who, under government auspices, had evacuated with their factories to the rural areas. Yet the overall results were gratifying; the evacuees were leaving the urban areas in greater numbers, and as people made arrangements with friends or relatives to house them or their children, the problem of social conflict was reduced. The evacuation of 1940-41, unlike the evacuation of 1939, brought less resentment towards the refugees on the part of the hosts.

A New Threat and The Third Evacuation

In the fall of 1943, when the military experts were certain that the Germans had manufactured some sort of flying-bomb or rocket that would soon be operational, they suggested the revival of a plan to evacuate a portion of government personnel from London. It was believed that in the event of an attack the unprecedented power of the new weapons would necessitate such a move. It was estimated that casualties resulting from the blast of a single rocket might amount to 600 killed, 1,700 seriously injured and 2,400 slightly injured. Furthermore, unessential personnel from London, Southampton, Portsmouth, and Gosport were to be evacuated within ten days of the first rocket attack. (30)

On the 12th of June, 1944, the first flying-bomb fell in the metropolitan area of London. In the first Fortnight, 1,600 people were killed, 4,500 seriously wounded and 5,000 slightly injured. Although the total tonnage of high explosives dropped was less than that dropped during the worst part of the big blitz of 1940, the rate of casualties was much higher. The higher casualty rate was caused by the fact that the flying-bombs came without warning, and often during the day, when many persons were outdoors or at work. The Home Secretary stated that after five years of war the people were not as capable of standing up to the strain of air attack as they were in 1940-41. The Civil Defense machine was depleted and weak, and the authorities looked to the future with apprehension. (31)

A third and final evacuation was initiated.

The movement of school children from the affected areas did not start until July 3, three weeks after the attacks had begun, though many persons evacuated privately. This caused some criticism about the absence of an official scheme. (One reason for the delay was the fact that the military was shipping a massive quantity of goods to the Continental Bridgehead, and in order to prevent undue pressure on the railroads the government decided to delay the evacuation until the railroads were free to their obligation to the military.) By July 17th the government was evacuating 170,000 persons under the plan, but many more were leaving of their own volition. By August it was believed that 1,450,000 persons had evacuated, 275,000 by way of the government's program.

The Germans maintained a heavy attack against the British Isles in August, yet in that month it was reported that many of the evacuation trains were full of evacuees returning to the cities. Morale was generally good, though the flying-bombs did fall during the day as well as night and it was feared that war production would be hurt. The fact that air raids were called during the day resulted in the loss of man hours in the war plants.

The return of a great number of persons during August can be explained by the fact that the counter measures taken to meet the attack of flying-bombs became increasingly effective. Thus only 17% of the bombs reported between August 16 and September 5 fell in the greater London areas compared to 33% during the previous months and 44% during the first five weeks.⁽³²⁾ (Even though it was reported that many persons were returning home during August and September, the chart on page 14 shows that over a million persons were still in the reception areas during September. This contradiction probably can be explained by the fact that those who evacuated on their own were non-essential personnel, more mobile than the young mothers and school children who had evacuated under the government's scheme.)

By mid-November, in London (even though the bombs were falling in greater number than in October) it was reported that the population was only eight per cent smaller than before the attacks began and the authorities were troubled by the fact that the evacuees were returning home in large numbers.⁽³³⁾ The flying-bombs and rockets did not stop falling until May of 1945 though the incidents of attacks had been diminishing since February.

Comments and Criticism of the British Evacuation

There are few analysts today who would deny that the British evacuation scheme was a success. There is no doubt that lives were saved and casualties lessened. Because the scheme was carried out efficiently, and the government was able to react to the threat of air attack with dispatch and ingenuity, the morale of the people was high. During the war years and for a number of years afterwards the scheme was pronounced a failure. However, now that students of civil defense have been able to compare the British plan with those of the totalitarian states, few would doubt that the effort was a success.

We have already commented on the command and control problems, the confusion engendered during the first evacuation, and a number of problems which confronted the evacuees in reception areas. In critiques of the evacuation written either during or immediately following the war, the evacuation was usually pronounced a failure. The major criticism of the evacuation, however, was that a large proportion of those who registered to evacuate did not leave the city under the auspices of the official scheme. Furthermore, at that time the ability to continue formal education

BRITISH GOVERNMENT SPONSORED EVACUATION SCHEME

	100,000	200,000	300,000	400,000	500,000	600,000	700,000	800,000	900,000	1,000,000	1,100,000	1,200,000	1,300,000	1,400,000	1,500,000
September 3, 1939 (Declaration of War)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
January, 1940	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
August, 1940	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
September, 1940 (Second Evacuation begins)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	First Heavy Bombing on London														
February, 1941	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
September, 1941	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
March, 1942	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
September, 1942	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
March, 1943	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
September, 1943	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
March, 1944	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
June 12, 1944 (Third Evacuation)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	First Flying Bombs and Rockets														
September, 1944	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
March, 1945	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
September, 1945	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Number of Persons in the Reception Areas -----

appeared to be another criterion by which the critics judged the evacuation. When the first evacuation took place and members of the same school classes were sent to different cities and the evacuation system appeared to be in danger of breaking down, the critics of the scheme launched a concerted attack against the government.

Although there were many problems involved in these evacuations, the British effort seems to have resulted in the most successful evacuation during World War II.

Soviet Union

On several occasions during World War II, the Soviet Government evacuated whole towns in the face of advancing Nazi armies. Evacuation of non-essential civilian personnel was not a matter of top priority however, because of inadequate transportation systems. Evacuation was primarily voluntary.

An evacuation of women and children from Moscow took place after the city suffered attacks from the Nazi air force. When outlying areas of the city came under similar attack, most of the Moscow refugees who had fled to these reception centers moved back to their homes in the metropolis.

When Moscow was besieged in October 1941, it was estimated that 400 to 700 thousand persons fled the city. By the 19th of October, the deterioration of the military situation had created an unorganized and chaotic evacuation of the diplomat corps and foreign press, the party and government elite, and key industries with their work forces. (34)

Party and government officials were reported to have been overzealous in seeking refuge, disobeying government orders to remain in Moscow. Many workers who were ordered to leave refused to do so. Some reasons for this behavior are worth noting.

By October of 1941, the myth that the Red Army was invincible was destroyed by the advancing Wehrmacht. Many Russians were not only shocked to learn that their nation was in fact a second class power, but were angry and ashamed. However, soon after the initial shock had worn thin, apathy set in. (35)

In October Moscow was in a state of chaos. The militia and NKVD had left the streets and the burning of official records and exodus of government and party officials convinced many that the government was about to crumble. It was learned that the government and party elite had the best accommodations on the trains and commanded most of the automobiles and trucks and the best shelter in the reception areas. These circumstances convinced many a worker that to break up his family, leave his apartment and possessions, and seek refuge in foreign environs was not worth the effort. The living conditions in the reception areas were harsh, food was scarce, the work hard, and the "hosts" hostile. Those who had evacuated after the first bombs had been dropped on Moscow had filtered back to the capital and informed their friends of what to expect from evacuation. Thus many Muscovites decided to stay behind to face the Nazis rather than to contend with evacuation. (36)

Many persons who had fled the city had been ordered to stay, but, when radio Moscow announced that the Germans had broken through the outer defense of the capital the people were certain the Nazis would be entering the city in a matter of minutes.⁽³⁷⁾ The Russian people had come to distrust the official radio broadcast because the government news releases were always "optimistic". (Rumors are especially powerful in a community where the "legitimate" means of communication are censored. The flight of many Muscovites who were specifically ordered to remain in the city can be explained under these circumstances.)

Communication during, before, and after evacuation is basic to the success of evacuation. If the Soviet regime had established itself as being reliable the flight of the party and government elite and the chaos which characterized the October crisis in Moscow might never have reached such serious proportions.

On the other hand, there were amazing evacuations of skilled workers and entire industries from West Russia to Siberia and the Urals. Though the conditions under which the evacuation took place were abnormal, and thus gave impetus to the movement, the operation contributed appreciably to the Soviet's final victory.

Japan

In Japan, in contrast to Great Britain, no planned evacuation program was introduced, though a makeshift program was manufactured to alleviate the suffering of those refugees who fled the bombs of the U.S. Air Force. An estimated one quarter of the urban population of Japan at one time or another left their homes due to the fear or actual disaster of bombing.

Unlike the British, the Japanese prepared for passive defense of the Islands as early as 1928. On July 6 of that year the Japan Times reported:

...siren shrieks rent the air, two million odd citizens (of Osaka) tasted the experience which military experts predict will be the lot of the civilian population in the event of a war in the future.⁽³⁸⁾

These early tests were of little practical value, except perhaps in preparing the Japanese people psychologically for the possibility of war.

There was no government-sponsored evacuation in the early years of the war, but with the B-29 raids in 1944, urbanites began to leave the cities, and by October, 1944, two million actually had done so. Yet this was still a selective evacuation of non-essential personnel and bombed-out persons. With the first great fire raid on Tokyo in March of 1945 evacuation became widespread. Raids on Nagoya, Osaka, and Kobe produced wholesale evacuation. The exodus of the urban population got out of control and the government was compelled to distribute food rations to every evacuee. In April and May of 1945, one million persons evacuated Tokyo and the final estimation (an underestimation) of evacuees throughout Japan is said to be 8,500,000.⁽³⁹⁾ An idea of the wholesale character of the evacuation is suggested by the fact that 37% of the gainfully employed evacuees worked in war industries. These workers were essential to war production and had been specifically ordered by the government to remain at their jobs.⁽⁴⁰⁾

The most successful part of the program was the scheme undertaken to remove the children from the urban areas. The Strategic Bombing Survey reports:

This phase of the program achieved success because of its compulsory features, and it may be assumed that the other projects would have been more effective, and the government insisted and forced the issue. The conclusion is reached that an integrated, well executed and compulsory evacuation program involving all unessential persons will be necessary in future wars, if nations are to survive the effects of atomic weapons.⁽⁴¹⁾

The Japanese evacuees, like their counterparts in Europe, were reluctant to move because of their concern for family and property. Some interviewees asserted, as did many Russians and British who were faced with the same dilemma, that "if we are to die, it would be better if the whole family died together."

One of the differences between the British and Japanese in individual behavior was that a number of Japanese waited until the bombs actually fell before they decided to flee the cities. Of course, many Britishers behaved in a similar manner, yet a considerable portion of the urban population did leave the cities in the first evacuation before a bomb was dropped. This difference might be explained by the fact that the Japanese believed they were safe from the attacks of the enemy air force while the British believed that their island would surely be hit.

The Japanese authorities presumed that normal governmental services, somewhat augmented for emergencies, could cope with any evacuation problems that might arise, and planned accordingly. Proponents of civil defense in Japan had grossly underestimated the potential of future air attacks because the military maintained that no massive air strikes against the home island could be expected. Hence, the exodus of the urban population was haphazard. Panic arose due to lack of preparations, and under heavy air attack the scheme broke down. Throughout the war the government's policy appeared to be: "Let the individual shift for himself." For example, the Japanese tended to regard the whole countryside as a reception area and urged the evacuees to go to their relatives regardless of the distance.

However, in the final report of the Strategic Bombing Survey on Japan, the authors concluded:

... the results of Japanese Civil Defense were spotty. Some of its services definitely cushioned the effects of bombings, while others were negligible. Portions of the non-essential population were evacuated from the larger cities. Some type of shelter even though generally inadequate was provided for the entire population. Adequate air raid warning was generally given. Fire lanes were constructed and sufficient organization was in existence to give some form of leadership to all people affected by the raids. It would probably be no exaggeration to say that Japanese casualties would have been several times greater had these steps not been taken. (42)

The German Experience

Although the German proponents of civil defense were working on the problem years before the European war erupted, and were relatively free from interference, they in fact had adopted an unrealistic attitude towards evacuation. By the mid-1930's they were convinced that the war would be a relatively short affair. Consequently little thought was given to a long-range evacuation though an extensive shelter program was introduced.

The several evacuation schemes that functioned after hostilities commenced were directed toward accomplishing the following: to save life and prevent injury, remove non-essential personnel to safe areas, to provide emergency care and new living quarters for those who suffered bomb damage or were bombed out of their homes.

The planned evacuation of civilians was divided into two categories: first, the evacuation of personnel whose presence in vulnerable areas was not necessary, e.g., mothers and pre-school children, school children between the ages of six and ten, persons who could find shelter with relatives, pregnant women, and the old and feeble; and second, the evacuation of persons who were homeless as a result of air attacks.⁽⁴³⁾

The Nazi Party assumed full responsibility for evacuation for its propaganda value. Prior to the war the National Socialist People's Welfare Organization operated two programs upon which evacuation was to be developed: a scheme for country holidays for children for health and recreation purposes which eventually became the "Extended Children's Evacuation Program," and the mother-children help program through which care was extended to expectant mothers and mothers of small children.

The basis of the original plan was the assignment of a single reception area, situated in a remote part of Germany or even in a foreign country, for each target district from which personnel were to be evacuated.

These areas were picked first because of their distance from vulnerable targets, and secondly, since the practice of sending school children to these areas existed before the war. However, the distance between the evacuation and reception areas became the principle obstacle to the successful maintenance of the plan as the war progressed.

Evacuation During War

In the early months of the war a few wealthy persons re-located to their country homes in the German hinterland but there was no large-scale movement of urbanites to the country and no measures were taken by the government to effect an evacuation at that time. However, in the summer of 1940 the Government was compelled to undertake measures to relocate those persons who had been bombed out, and a small number of women and children who were situated in certain vulnerable areas were evacuated as well. But it was not until the autumn of 1940, that Berlin, Hamburg, and some of the other large cities launched campaigns to evacuate children under the Extended Children's Evacuation Scheme on a large scale. The plan proved successful where it was undertaken; e.g., Hamburg evacuated 80,000 children. Cities which had not pursued an evacuation scheme with as much vigor achieved relatively poor results. It was still widely believed that the war would be of short duration and since the program was voluntary in nature and the incidence of air attack was still relatively light, many persons were reluctant to leave their children. (44)

In 1941 the incidence of air attacks increased, and the people began to show a greater interest in evacuation. The government prepared for the "full scale" evacuation of school children living in vulnerable areas. Nevertheless some parents remained adamant and refused to comply with the authorities' request to evacuate their children. The Government then decided to put pressure on recalcitrant parents by refusing to permit their children instruction after their class-mates had been evacuated. However, the government did not put this plan into practice until the autumn of 1943 when for the first time entire schools were evacuated.

In 1942 the number of bombed out people increased and with their flight to reception areas, the plan began to break down. For example, as the allied air strikes grew in magnitude people were being sent to localities which had not prepared for their reception and whole trainloads of evacuees were sent to centers unable to handle them. Refugees who were billeted in such areas were subject to eviction by local authorities in the event of the appearance of people who were officially assigned to the centers in question. The "Intra District Evacuation" plan also resulted from intensified attack. Under this program the evacuees were removed to reception centers within their own districts, to sectors that remained unbombed. When these districts came under attack as well people chose to return home. The evacuation of school children functioned effectively until

August, 1943; 300,000 had been evacuated to the countryside.⁽⁴⁵⁾ By the spring of 1944 the prewar camps constructed to handle school children became overcrowded. From then on children were included under the jurisdiction of the intradistrict plan. Under these circumstances the evacuees returned home in ever growing numbers. This reversal resulted in the exacerbation of the problems of passive defense in Germany.

From 1944 on, the plan deteriorated to such a degree that cities were evacuating people only to have refugees moving into these same cities seeking shelter. Near the end of the war, the Nazis decided to destroy all evacuation records and thus the problem of re-sorting and returning refugees to their proper localities was severely compounded.

Comments

Estimates of the number of evacuees who were cared for in Germany have been declared to inaccurate that no attempt has been made to indicate the approximate number of Germans evacuated during World War II.

As in Great Britain, evacuation was undertaken on a voluntary basis, but as the war progressed evacuation became mandatory in some instances and billeting came under government control. The government paid for the evacuees' food, lodging and incidentals. However, evacuees with private means were required to pay for their upkeep and in cases where husbands continued to work at civilian jobs they were required to send funds to their families in the centers.

The fact that so many persons had evacuated to remote areas of Germany resulted in great confusion later, when communications and transportation suffered from heavy air attacks. The confusion was magnified as a large number of distraught individuals attempted to establish direct contact with family and friends. This massive activity of civilians detracted from the military's efforts to untangle the transportation problem. Indeed, the deterioration of the evacuation scheme undermined the morale of the civilian population, to the point that wide-spread open criticism was heard of the Nazi regime for the scheme's failure.⁽⁴⁶⁾ The aversion to evacuation in Germany closely paralleled the feelings in other war-torn countries. Given a choice, most people preferred to remain near their homes rather than to travel to distant reception centers. Some of the reasons for the preference are similar to those reported in the British experience, e.g., people were afraid of unknown living conditions, they did

not like the necessity of adjusting themselves to language and custom differences, they feared the separation from family and friends, and preferred the risk of being bombed at home to the risk of being bombed away from home. (47)

The heavy bombing raids on Germany and the ensuing invasion confuse the history of the evacuation effort to such a degree that it is difficult to reach any final estimation on its effectiveness.

World War II and Today

In the preface we noted that this paper was not concerned with the strategic implications of evacuation in a nuclear era, nor was it intended to demonstrate whether or not evacuation can work today. In concluding, we shall refer to difficulties that analysts of today's problems might find especially interesting.

Pre Planning

It was not until the Munich crisis in the fall of 1938 that the British government came out from behind closed doors to plead its case for Civil Defense. Up to that time they considered it too delicate a matter to discuss before a public forum, fearing that pacifists at home would utilize the debate as a means to prove that the government did not want peace, and that the Germans might interpret overt civil defense preparations as being provocative and calculated to intimidate the Third Reich. The result of secret planning was graphically illustrated during the Munich crisis when the local authorities exhibited a gross ignorance of their duties in the event of air attack, and a large number of persons, not knowing what else to do, fled London.

Nevertheless, those few who worked diligently for a passive defense system for the British Isles were able to manufacture a paper plan that served as a foundation on which the government was able to build after the Munich Crisis of 1938. Yet the problems which the government was to face at a later date might have been ameliorated if the Civil Defense authorities had come into the open sooner and educated the public and local authorities to the measures that could be taken before, during and after an air strike.

Educating the Public

In an Australian study of the British evacuation (48) it was pointed out that propaganda for the scheme had a deleterious effect. There was serious discrepancy between what the government implied the evacuation would be like and the actual conditions which the evacuees faced. Because there was a marked difference between "theory" and "practice," many evacuees reacted against the scheme from the first. The authors of the report concluded that public relations committees should have been formed to educate the public by supplying detailed and realistic information concerning measures to be taken during an air strike and in a post-attack environment.

Communications

During the World War II the Soviet government could not control the evacuation of Moscow because its citizens had come to distrust the reports that originated from the government's radio stations. Hence when the time came for them to follow the Kemlin's directives, during the siege of the capital, a good portion failed to comply with the government's orders. Those of the government and the party elite, who were ordered to stay behind to continue governing the city, believe that they were being sacrificed, while many of those who were asked to leave refused because they felt the government had failed to take any measures to insure their well being during and after their evacuation.

The lesson here is that the government must take care to establish a relationship of trust with the people. However, even after such a relationship is achieved, the government must take care not to confuse the people by a flood of directives. The evacuees must be kept well informed but they should not be burdened with instructions that are too complicated to ambiguous.

Successful communications between the people and the government depends primarily upon previous preparations, pre-evacuation education and sophistication in the command and control system. The problem of maintaining communications once evacuees have arrived at reception areas must not be overlooked. If the evacuees should remain in the reception centers for a long period of time the problem of motivating them to follow orders will become more difficult as the tensions and strains, characteristic of the life of the refugee, grow in magnitude.

Reception of Evacuees

World War II experiences suggest that as much effort should be expended upon the reception of refugees as on their evacuation from the cities. (In the nuclear age one might question whether the problems are equal in import.) If the refugees from the cities should remain in the reception areas for weeks or months, the problems of continuity of government, economic scarcities, and social conflicts, for example, could be fundamental to the readjustment of a society in a post-attack environment. Evacuation planning should not only be designed to save lives from nuclear attack but to mitigate the emotional pressures of relocation. The morale of the population in a post-attack world might be an essential element of material and psychological recovery. Contingency planning should also consider the measures to mitigate the economic fears of both evacuees and hosts in an effort to encourage evacuees to remain in reception areas.

Command and Control

It is popularly believed that in the event of a nuclear war the urban populations of our nations would be so terrified by nuclear attack that they would flee the cities in panic and hysteria at the first sign of war, or while they were being asked to evacuate in an "orderly manner." Hence a large force of troops would be needed to control the panic stricken masses as they fled the cities. However, World War II data and subsequent disaster studies indicate that there was very little panic or hysteria evidenced in the evacuations of the last war. Furthermore, an evacuation might be successfully carried out in an emergency without a large body of personnel guiding the evacuation. Nevertheless, the long range problems that would arise with a protracted evacuation would necessitate a sophisticated command and control system. Contingency planners should attempt to be prepared to guide an evacuation under all conditions and time restrictions.

The economic and prudent use of trained people who can expedite the evacuation and work with the Civil Defense teams in the reception areas is essential to good administration. The British were criticized for their inefficient use of trained personnel.⁽⁴⁹⁾ (An administrative problem of another nature that arose in Great Britain demonstrated that Civil Defense personnel proved to be effective and reliable where their own families were not involved. Hence, in the event of an evacuation today, one solution would be to recruit Civil Defense personnel from the National Guard, the regular Army, or from any organization which has no direct "interest" in the evacuation of the persons in question.) However, the British did make use of trained personnel from their educational system. For example, teachers played a vital role in the evacuation process. They registered children, guided them to railroad stations, accompanied and cared for them on the journey and helped place and maintain them in reception areas. Social workers, school teachers, nurses, and other trained personnel familiar with the problems of dealing with the public are an important source which should be tapped in the event of a future national emergency.

Finally, we must ask whether we should prepare for a directed voluntary, or mixed evacuation scheme in the event of a nuclear engagement. Obviously the enormous differences between the bombs of World War II and the thermonuclear weapons of today, have made major changes in the problems of evacuation. For example, we may

be forced to evacuate entire metropolitan areas rather than industrial sections of cities, while we must consider special problems for which there are no precedents, such as fall-out in reception areas, and prolonged contamination of target zones. Finally, there are crucial strategic questions affecting the problem, such as the conditions under which population centers, as distinguished from military or industrial centers, are likely to be attacked.

FOOTNOTES TO APPENDIX A

1. Terence H. O'Brien, Civil Defense (London, 1955), p. 33
2. Ibid., p. 6
3. Richard M. Titmuss, Problems of Social Policy (London, 1950), p.9
4. Ibid.
5. Ibid.
6. O'Brien, p. 39
7. William Boyd, Evacuation in Scotland (London, 1944), p.1
8. Padley & Cole, Evacuation Survey (London, 1940), p. 19
9. Ibid., p. 34
10. Titmuss, p. 28
11. O'Brien, p. 282
12. Titmuss, pp. 19-21
13. O'Brien, p. 160
14. Ibid.
15. Titmuss, p. 30
16. C.E.M. Joad, Why War (London, 1939)
17. Titmuss, p. 34
18. E.S. Turner, The Phoney War (New York, 1961), p. 12
19. Titmuss, p. 101

20. Boyd, pp. 55-56
21. Ibid., p. 107
22. J.C. Kenna, Australian Council for Educational Research (Melbourne, 1942)
23. Titmuss, p. 138
24. In Scotland, school children, left with mothers and not school parties. (Titmuss, p. 103)
25. Titmuss, p. 33
26. A.D.R. Owen, "The Great Evacuation," The Political Quarterly (Jan-March, 1940, London), p. 12
27. Padley & Cole, p. 5
28. Titmuss, p. 155
29. Ibid, p. 363
30. O'Brien, p. 648-653
31. Ibid, p. 653-654
32. Ibid., p. 657-658
33. Ibid., p. 666-667
34. Leon Goure, Moscow Crisis (Glencoe, Illinois, 1955)
35. Ibid.
36. Alexander Werth, Moscow War Diary (N.Y., 1942)
37. W.L. White, Land of Milk and Honey (Boston, 1947), pp. 54-64
38. U.S. Strategic Bombing Survey #14, pp. 74-75
39. Ibid., p. 75
40. Ibid., pp. 74-75
41. Ibid., p. 9
42. Ibid., p. 1

43. U.S. Strategic Bombing Survey #176, p. 176
44. Ibid., p. 75
45. Ibid., p. 126-129
46. Max Seydewitz, Civil Life in Wartime Germany (New York, 1945), p. 134
47. U.S. Strategic Bombing #176, p. 187
48. Kenna, p. 35
49. Ibid., p. 33

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Appendix BA Scenario Leading to Internal Crisis

This evacuation scenario is designed (1) to provide the reader with a basic context in which an evacuation of large segments of the U.S. population is imagined.

The format to be followed here will give an objective chronology of events that will be complemented, at each point in time, by subjective responses of an ordinary citizen. This approach juxtapositions a hypothetical sequence of international events and possible reactions of a perplexed spectator. A desired result is to convince the reader that the "feel" or "tone" of the scenario is not unreasonable.

An introduction to the background of the plot follows:

A Putsch takes place in Turkey on September 2, 1962. Within three days after the uprising the Turkey ambassador to the U.S. is ordered, by the Rebel Government to leave Washington, but refuses. Simultaneously, in an office scuffle, the Turkish delegation to the U.N. is "taken over" by one of its own members who then claims to be the legitimate representative of the new "Revolutionary" government.

The U.S. government maintains a "hands-off, wait-and-see" policy going so far as to allow a new "ambassador" to enter the country but without officially asking for his credentials. The U.N. refuses to seat the new "delegate" but allows him to sit with the Turkish delegation which numerically favors the Rebel government.

During this time, representatives of the deposed Turkish government call for U.S. aid to halt, what they call, a Communist inspired uprising.

There is constant fighting between the rebels and anti-rebel forces and the U.S. sends part of its Mediterranean striking force to the Aegean Sea. This act is immediately denounced on the floor of the U.N. by the Polish delegate who goes on to claim:

"...that the U.N. is acting improperly in refusing to recognize the new People's government in Turkey. This is unfair, since it prevents the new government from telling the true story..in order to see justice done I have ordered my delegation to distribute copies of an official statement from the new Turkish delegate explaining the true course of events."

After several days of sporadic news from inside Turkey, there is an urgent plea from the Turkish President in exile for United States intervention to prevent a complete takeover of Turkey by a group of rebels who are under direct orders from Moscow. The United States acts quickly and decisively by sending three Marine battle-groups into the city of Bursa in support of the anti-rebel forces.

The Polish delegate to the U.N. strongly objects to U.S. intervention, and labels it a naked act of classical, colonial aggression. Zorin demands that the U.N. condemn the U.S. action while Pravda hints that Russian volunteers from Georgia, Armenia and Azerbaijan, are offering to fight for the new Turkish government.

The United States stands firm in Bursa threatening to march on Adapazari, the Rebel stronghold. The Rebels counter, by calling for all-out Russian aid. This plea is answered by the Soviet Union sending a large landing force to an offshore position in the Black Sea near Zonguldak. And, at the same time, reports are heard of 10,000 Russian "volunteers" joining the Turkish Rebel army.

OBJECTIVE CHRONOLOGY

SUBJECTIVE RESPONSE

Sept. 13: Three battle-groups of U.S. Marines engage a large force of Russian "volunteers" in a pitched, two-day battle near Adapazari. The Russian "volunteers" are fully equipped with the latest Russian equipment and inflict heavy losses on the American troops--killing and wounding about 3,000 men.

Up to this day, I didn't follow too closely the chain of events. My first impression seems to have been that this Turkish thing is another Laos or Thailand mess and nothing too serious will come of it. It's too bad about the Marines but...what can you do? Besides, Mantle pulled a thigh muscle and that's something to worry about.

Sept. 15: President Kennedy gives the first "fireside" chat since F.D.R. warning, "...that we cannot renege on our obligations to our NATO ally and we will not be fooled by Russian troops disguised as 'volunteers,' nor will we allow them to kill our men." In response to the President's speech and the loss of American troops our NATO allies start a full scale conventional military deployment of their forces: Two companies of British commandoes fly to Bursa and the U.S. sends the 101st Airborne Division and the 1st Infantry division, into Turkey.

Sept. 17: Khrushchev tells the Russian people, "We will not watch idly while our brothers are massacred by the capitalist forces....I have ordered five divisions into Zonguldak." In answer to the NATO mobilization, Russia puts her army on an "alert" basis cancelling all leaves. NATO troops begin to gain air superiority over the Turkish Rebel-Russian "volunteer" forces and once again threaten the Rebel stronghold at Adapazari. In what appears to be a final move against the city the NATO forces unexpectedly meet Russian-built MIGS, flown from Turkish bases, which attack U.S. carrier-based A3D2's. Russian-built fighter-bombers strike our NATO aircraft bases, in a surprise move, inflicting severe damage to grounded aircraft and rendering the bases temporarily inoperable.

I'm now beginning to read the headlines and watch the news on TV which seem to be following past patterns. HUNTLY & BRINKLEY suggest that we must act responsibly, while the N.Y. Daily News warns against any more Munichs or Yaltas--it wants to show Khrushchev we're not chicken. I'm worried, but force myself to still read the sports section first. This pays off because the Yanks have regained first place.

Maybe I thought we're in trouble. After all, 40 planes plus bases is a lot of damage. I'm also not so happy about the increased draft-call and reserve build-up. It would be just my luck to end up in Adapazari.

Yet, I guess we really can't give them Turkey because that's what happened with Hitler and it didn't help there. Somehow, Turkey seems so far away--I mean, England I can see fighting for--maybe...

But, with a little luck Kennedy will get us out of it and maybe I'll get to see the World Series. It looks like the Yanks vs. San Francisco--now how about that!

NATO forces are repulsed and reform in Bursa. The Naval striking-force reports 40 fighters and bombers missing.

Sept. 18: President Kennedy in his second "fireside" chat informs the country that, "The World situation is considerably worsened..... After much thought and consultation with the NSC, JCS, and leaders of both parties I have put our armed forces on 'super-alert' and informed the Russians that we will not allow their take-over of Turkey nor will we tolerate their acts of aggression on NATO aircraft and bases. The responsibility for war now lies clearly on Russian shoulders."

Sept. 20: Khrushchev announces publicly that the Soviet Union cannot tolerate NATO intervention in the internal affairs of Turkey. "Hereafter", he declares, "we will continue to assist the legitimate government of Turkey, by any means, to prevent the overthrow of Turkey's legitimate government by outside imperialist forces."

President Kennedy answers: "Premier Khrushchev and the people of Russia should know... the U.S. will retaliate and repulse all Soviet attacks on NATO forces in kind..."

"Things look very bad." I said to my friends during the Friday night fights at "Nicks". "We need to close ranks and stand behind the government." Some guy next to me agrees and says, "I belonged to a Peace Group but now I feel that the situation has changed sufficiently so that I am withdrawing my support."

Some of the guys egg me on to call CD headquarters in N.Y. on sort of a whim and I was told they were temporarily out of literature. To hell with the Yanks, I thought, maybe I ought to take my vacation now--just in case.

"Listen, we're in a mess," I said to my friend, Hank. "I don't think Khrushchev is kidding and neither is Kennedy. This could mean another Korea or even a World War III. But, I'll tell you one thing. If it's a nuclear war I don't want to be in this city when it comes. Maybe, I can find a long lost aunt in the mountains of West Virginia." I don't know why, but I go out and buy a case of canned milk.

Oct. 26: During this period the fighting has intensified-- the Soviet Union is openly supporting the Turkish Rebels with troops (over 15 divisions), equipment and aircraft.

The NATO forces are mainly made up of American divisions (6 +) as England isn't prepared and France claims none to spare. The NATO airforce consists of carrier-based A3D2's and fighter-bombers from bases in Greece.

The proximity of Bulgaria and Russia give the Turkish Rebels a military advantage so that they control most of the country except for a small area from Bursa to Izmir. Peasant resistance to the rebel government is forming on the Anatolia plateau. In an unexpected move the U.S. sends a landing force into the Sea of Marmara in order to establish a beachhead near Golguk.

A 5,000 man unit of "Special Forces" is dispatched from N.C. and dropped in the vicinity of Tosya to harass supply routes and organize guerrilla resistance. The U.S. 10th Army continues to threaten the Rebel stronghold in Adapazari.

The Soviet Union, under extreme pressure from a military bloc, headed by Marshall Malinowski, has sent 10 more divisions into Turkey during the last week.

Malinowski addresses the Soviet people saying: "...we will prevent an American takeover of the Straits at all costs." Khrushchev, under great pressure, informs Kennedy

I, frankly, don't know who in hell Malinowski is but this guy could easily upset the boat. I'm really very scared. Congress is yaketing around the clock and it's rumored that the President and his staff have left Washington. Some of my friends who own private homes are building shelters. I even know of several people who have left the City to go to relatives' homes in areas away from the City. CD is very active again and I'm on a list of "Warden's aids." My name is stuck up over the mail boxes in my house.

I get Fulton Lewis, Jr. one night on the way home from work and hear him say, "Don't make Bulgaria into another Yalu....." right wing risks nuclear annihilation over Bosphorus....."

One of my neighbors is quite disturbed over Lord Russell dying on a hunger strike in prison and says, "You just don't expect the English to behave in such an uncivilized manner."

All in all, it looks like Russia means business and I really have to strain to feel good over Ford beating San Francisco in the final game of the World Series.

that Russia considers access to the Black Sea an inalienable Russian right and will view any attempt to violate this right as an open, premeditated, act of aggression."

Oct. 28: There is a two-day battle in the Sea of Marmara in which the Soviet Union suffers the loss of 60 MIGs, two submarines and 4 destroyers.

As a result of her loss in the Battle of Marmara and internal pressures about weakening her position in Europe by withdrawing troops for the Turkish front, Russia, in a surprise move, signs a peace treaty with East Germany.

The East German government immediately closes all routes of access to West Berlin until she is given full recognition by the West.

Oct. 29: After a well-planned attempt by the East German underground to tear down the Wall in the vicinity of the Brandenburg Gate, Chancellor Adenauer officially recognizes the act as a legitimate uprising and publicly offers assistance to the underground if requested.

Oct. 30: Defense Minister Strauss orders the army to the East German border and asks for U.N. recognition of the underground as the new provisional government of the East Republic.

The fighting in Turkey continues as sheer Soviet numbers in the field begin to push the NATO forces back toward Izmir. The U.S. is forced to choose between strengthening her forces in Turkey

I couldn't help remarking to my friend Harvey at our poker game that it looks like the Germans will do it again. On the other hand, I strongly feel that the Russians mustn't be allowed to get away with anything. I, frankly, don't know what I'd do if I were in Kennedy's shoes. I feel pretty confused over the whole matter and wait to see our government's next move. I just feel angry because now we seem to be heading for a worse situation. This, I thought, is the way wars start.

I stay home from work to hear Kennedy say he's going to reopen the routes to West Berlin within two days--and we'll meet East German opposition with the full force of NATO.

Turkey and now Germany, I think. We're in for trouble and maybe big trouble at that.

The draft call is over 50,000 for next month and it looks like the winter will be a long, cold one.

Harvey says to me, "If we're not already in a war, I don't know what else to call it!"

at the expense of her position in Europe. It is believed that the NATO forces could not hold both if the fighting became severe.

Oct. 31: On this day, an East German underground unit attacks a Russian supply convoy, from ambush, near Lenzen and attempts to escape across the border into West Germany.

As the East Germans approach the border, a company of West German infantry intercede by crossing into East Germany and engage the pursuing Russian troops. The Russian troops are only equipped as convoy guards and are destroyed to the man by the superior firepower of the West German troops.

Nov 1: Khrushchev, in a nation-wide broadcast, claims "that the West German strike, into another country, against an unarmed supply convoy was a wanton act of naked aggression tantamount to an attack on a Red Cross Convoy. The transgressors must be punished..."

The East German government, with massive Soviet aid, crushes the rebellion. At the same time, there are incursions into West Germany by Russian, Czechoslovakian, and East German troops at places all along the frontier from Lubeck, in the north, to Passau, in the south.

It's funny the way things seem to go on without anybody being able to stop them. Germans fighting Russians is not so bad if it only stays that way...

"Full wartime mobilization," is in the headlines and things begin to feel like they were during World War II. I attend two going-away parties for friends on the block.

Things are moving so fast I don't know who's right or what. The papers are full of talk about NATO not being able to stop the Russians in Europe and that they will drive to London if we don't stop them with nuclear weapons.

I don't care how we stop them--just so long as the whole thing stops before it's too late.

5

Nov. 2: The West German army launches a full-scale attack against East Germany and an armored unit succeeds in reaching the outskirts of Wittenberg in a daring maneuver.

Nov. 5: Marshall Malinowski invades West Germany with 50 divisions destroying all but remnants of the West German Army and sweeping the NATO forces back to the Rhine where they deployed for a last stand against insurmountable odds.

President Kennedy is under great pressure from his military advisors to use tactical nuclear weapons against the Russians but hesitates because of counterpressures from the British and some of his close non-military advisors who suggest that he first contact Khrushchev.

Nov. 7: The Soviet forces break through and cross the Rhine at Philippsburg driving toward the ammunition depot at Kaiserslautern.

President de Gaulle warns, "...any foreign troops that cross into French soil will be stopped with whatever force is necessary."

Nov. 8: Kennedy again fails in efforts to contact Khrushchev, who appears to be no longer in control of his military forces. Our SAC is on "super-alert" and England informs us that a Russian sweep to the Channel is only a matter of days.

Nov. 10: The Soviet military Machine generally is unopposed in its march across Germany. As it approaches the borders of

Some people say war is going to happen any minute. My neighborhood is being organized by CD and I'm promoted to a warden--arm band and all.

There are many people leaving the City and I know of several friends who have already left. I keep thinking, what should I do--I wish I knew more about radiation... Most people I talk to are scared.

I think we're already at war and wait to hear from Kennedy. Congress has declared a national emergency and TIME magazine calls for an evacuation to start. I'm living with my sister out on Long Island and commute to work, but I'm not going in today!

Many papers claim that Malinowski is really giving the orders and that he cannot be trusted to act rationally. It is rumored that Khrushchev is under house arrest.

N.Y.C. is at a standstill. No one will go to work or school for fear of an attack on the city--Some

Belgium, Luxembourg and France, some of the NATO forces retreat into these countries, while continuing to fight the Soviet troops. This action provokes the Soviets to advance beyond the borders of Belgium, Luxembourg and France.

French troops use ten small tactical nuclear weapons against the Soviets near Verdun, killing an estimated 15,000 men.

This action is vociferously denounced by the Press of the "neutral" countries. General anger is expressed toward de Gaulle, from the floor of the U.N., by the Afro-Asian bloc. De Gaulle maintains, "I could not allow another rape of France..." The NATO countries remain silent.

Nov. 11: Malinoswki states, "... we will reduce Europe to ashes in a day.....for 1,000 years, no one will ever again dare to use nuclear weapons against Russia..." NATO reports, during an ominous one-day lull in the fighting, that several Russian divisions are being equipped with tactical nuclear weapons!

Nov. 12: U.S. intelligence informs President Kennedy that the Russians are evacuating their largest cities and have put others on a "stand-by" alert.

Many Russian civilians are wearing CD uniforms and organizing the populace.

people begin boarding up stores and windows. Sand is selling for \$20 a cubic yard on the Blackmarket, when you can get it.

I don't see what can be done... Most people stay at home and wait... I went to my bank and withdrew my savings--hell, the banks will go just like everything else and burned money isn't much good.

Nov. 13: President Kennedy orders an immediate evacuation begun and to be completed without delay. This order follows a speech in which he announces that ".....if the Russians do not stop their advance immediately and pull their troops back to the original East German Borders within seven days, the U.S. will live up to its commitments to Europe."

I was walking the last two blocks to my house when Pat yelled, "Didn't you hear it?--We're going--the whole damn city has been ordered to leave by the President!"

Appendix CPossible Impact of Two Hypothetical Wars onU.S. Democratic ValuesIntroduction

This scenario has been formulated to illustrate two possible social consequences of large-scale nuclear war, which are somewhat contrary to one's initial expectations. It is often assumed that the United States would automatically lose its democratic values in any conceivable attempt to preserve them by resort to thermonuclear weapons. Many of those who insisted before World War II that in the attempt to stop Hitler's advance the defenders would be reduced to chaotic conditions and forced to adopt totalitarian methods now claim that the survivors of a thermonuclear war would be reduced to barbarism and come under some kind of dictatorship.

In the 1930's there was considerable speculation about how a fascist-type regime might be imposed on the United States. Sinclair Lewis gave us a novel entitled, It Can't Happen Here in which he imagined how it could happen. Yet the highly generalized speculations assuming the loss of democratic values in the effort to maintain a balance of terror or in the wake of a thermonuclear war have curiously not been subjected to detailed inspection.

The following scenario is one attempt to imagine what might happen to our social and political life under two contrasting wars of miscalculation. In the first case, the attempt is to provide a plausible sequence of events that might develop if the United States could strike its enemy in such a manner as to destroy most of his retaliatory power without itself sustaining severe losses in military capabilities, casualties or property. It suggests what might happen to the United States if it achieved by a miscalculation a status of world supremacy without a visible enemy left. In the second case, a situation is imagined in which the U.S. sustains huge losses as a result of an enemy first strike by miscalculation. It speculates on what might happen to our way of life in the wake of such a disaster.

It will be noted that the writer felt he had to assume a much better civil protection system than is currently in prospect in order to imagine a plausible capability for forcing a stalemated peace in which to organize recovery in freedom.

In both cases evacuation of major cities is presumed at the height of the crisis preceding the thermonuclear strike.

While the story line introduces many factors--political, diplomatic, and psychological--interacting upon each other, the scenario leaves much to be filled in by the imagination of the reader. It tries to pose the problems of post-war recovery in a fresh light, using a bizarre coincidence, and stresses the point that wars short of mutual annihilation are plausible. It suggests how the U.S., on the one hand, could lose its liberties without losing much materially and, on the other hand, retain democracy under conditions of vast material devastation.

THE GREAT MISCALCULATION

By Chester S. Williams

The most concise account of what happened following that disastrous miscalculation on January 21, 1965, may be found in a letter to posterity left by the Pulitzer Prize Historian, Arthur Schlesinger. This letter transmitted a 1,500-page manuscript dealing with that catastrophic event and its aftermath. It was dated almost three years after the event and was his final communication before he was arrested for his role (entirely intellectual) in the democratic underground. A member of his group found it in its customary hiding place and preserved it in the hope that one day it might be published to correct certain official myths.

The text of the unfinished Schlesinger letter follows:

December 18, 1968

To Posterity:

Whether the truth can make men free it is surely a prerequisite for the exercise of freedom. For almost three years now I have been trying to piece together the story of the fall of the Republic in the conviction that truth will be important to eventual liberation. Few of the hundreds who have contributed to this work are still at liberty; many have lost their lives. It is only a question of time before my remarkable good fortune runs out and the security police catch up with me too. As one person, I will no doubt be suppressed but it will now be difficult if not impossible wholly to suppress the truth which I have tried to write down for posterity.

I particularly salute those who have risked and sacrificed so much in our clandestine search for facts, for first-hand testimony, and for censored documents. In addition to those who have shared in the research effort, we are indebted to many devoted technicians who have reproduced this work on microfilm and distributed prints, chapter by chapter, to the most reliable members of the underground. In this letter, I will try to put the story in capsule form and to summarize the meaning of events as I have elaborated and documented them in the detailed manuscript. The resulting microfilm record, being more compact, can be more

widely circulated. It should thus alert many more friends of freedom to the existence of the three-volume work. It will also serve to stress the points in the story which have been most seriously distorted or suppressed by those who have tried to rewrite history in these past few years.

As one of President Kennedy's close associates who was frequently castigated by the right extremists for being "soft on communism", my evaluation of the severity of the crisis during the months preceding one disaster may be surprising. While the President's great caution was largely due to his own keen sense of responsibility and his determination, if possible, to avoid a thermonuclear disaster, I was often singled out as an architect of appeasement for presumably advising the President not to trade invectives in those tense times.

Some cartoonists pictured me as a Mr. Magoo leading the President into a lion's den while blithely counselling "a soft answer turneth away wrath". Therefore, many of my compatriots will be surprised to discover from the record in Volume I that I rather consistently supported the President's natural inclination to firmness--but without bluster.

Suffice it to say here that I, like others who were privy to the secret reports and intelligence during that critical contest of national wills, did not discount the terrible tenseness of the growing crisis. We understood well enough the natural frustrations and the fury over Soviet provocations which impelled so many of our countrymen to demand a showdown. We worried over the division of the country and Congress into a "war party" and a "peace party" as the "salami tactic" of the Soviets gradually sliced away our vital interests in Europe, Africa, Asia, and even in Latin America. The reliable photographic reports from our Samos satellites showing packs of Soviet submarines maneuvering in the North Atlantic seemed ominous indeed when viewed as a prelude to what happened next.

It was against the background of this kind of tension under a super-alert that the President and I turned away from editing a speech for the next day to catch the 2:00 A.M. newscast on the radio. Catastrophe came not with noisy uproar but with sudden silence. The newscaster we were listening to was stopped in the middle of a sentence. We soon learned that radio and TV receivers suddenly went dead all over the nation in an electronic blackout. Most alarming, our entire radar warning system was put out of commission. The telephone wires provided the only long distance means of communication.

The Soviets had boasted about a capability to negate our elaborate warning systems, and we had threatened to initiate a massive nuclear retaliation as a certain reaction to any such interference. We had said in effect that the interference itself would be accepted as a warning of impending attack upon us. It seemed incredible to all who gathered in the President's study that fateful night that Khrushchev would dare to doubt our resolve on this point.

Those who will read the record of the first few hours following the electronic blackout as reconstructed in my first volume will be amazed that so much could happen so quickly, particularly in removing the careful safe-guards against accidental war. Yet, each step leading to the moment of no return followed a relentless logic once the first false premise was accepted.

Science, in improving communication by giving us the remarkable system of satellite-telephonic connectors which were suddenly rendered unusable, had left us one standby transatlantic cable as the only line of communication to Moscow. When the Moscow operator reported that neither Khrushchev nor anyone else in authority could be reached since every line was in use, the conclusion seemed obvious: an attack was being mounted. And while Secretary of State Stevenson desperately urged the Moscow operator to break in a connection to the Kremlin, Secretary of Defense McNamara was insisting that the President and the Joint Chiefs proceed immediately to the underground War Center.

As the precious seconds ticked away, the FBI, to forestall later espionage, moved swiftly to round up the Soviet diplomatic staffs and every known agent.

Calls from London, Paris, and Bonn indicated that the electronic blackout already covered Europe, portending imminent attack upon our bases there. The massive interference has thus successfully countered the first wave of SAC planes dispatched under the fall-safe system. They would automatically turn back at the prearranged points in the absence of communications which could not be given as long as the blackout continued.

No one questioned the necessity of forcing the Soviets to end this interference under penalty of the severest consequences.

It is not surprising then that under the pressure of time, favoring a Soviet first strike, it was decided to send the next wave of SAC bombers with orders to proceed to vital military targets unless specifically ordered to return. Fail-safe therefore failed to be safe.

Adlai Stevenson was left clinging to that single wire into Moscow while the President and his party started to the War Center in helicopters. While Stevenson was trying to get through the warning to the Kremlin that only by lifting the electronic blackout could the Soviets enable us to stop the attacking force on the way, the buildup of a SAC strike was going forward apace.

Just as Secretary Stevenson breathed a sigh of relief over the announcement that the Moscow operator would now put him through to the Soviet Foreign Minister, the phone went dead. Within a matter of seconds, he became convinced that the United States was completely isolated, unable to communicate with the enemy or our overseas allies. Faced with this awful fact, even this incorrigible optimist--the much maligned leader of the so-called "peace Party"--conceded in his conversation with the President at the War Center that this final break in communications was the signal of an attack on the way. The ground was cut out from under him for any further plea of restraint. He recognized the rightness of the Air Force position: if our missiles were to have any slightest chance of blunting the attack and saving untold millions of American lives, they would have to be unleashed without delay. As he told me later, he consoled himself by recalling that American retaliation would be restricted to purely counterforce targets. Still, there were the nagging questions: Could his voice have saved the peace? What would the Soviet Foreign Minister have said?

No one even suspected what really happened. As we discovered much later, the Soviet submarines carried out standing orders to cut the transatlantic cable as soon as possible after the signal of an electronic blackout. Thus Soviet planners had hoped to immobilize the American bases in England and other points overseas. Who would have ever supposed that this defensive calculation would one day prove crucially disastrous to the calculators?

While the President and the High Command acted to release the missiles and to organize the followup waves of SAC forces, the British and French were giving assurances to Moscow by telephone. The American Commander of NATO was citing all of the reasons why an attack would not be unleashed in ways the Soviets feared, revealing in the process much Top Secret information in

his desperate effort to stave off a Soviet attack. He naturally assumed that Washington, though operating in the dark of night, was aware of the central fact already known in Moscow by the light of mid-day. But things move at a different pace when Morpheus holds the vast majority of a population in its arms.

The British and French were able to prove to the Soviet Ambassadors by the tapes of the earlier transatlantic conversations that the White House had not breathed a word about any plan to attack. This testimony carried great weight in Moscow. Moreover, the Soviet Ambassadors were also given convincing evidence that NATO had called off its alert and had grounded its bombers. No move had been made to fire the IRBM-Thors from England.

It was almost two hours after that sudden break in the newscast that a call from California came to Secretary Stevenson as he was leaving for the War Center, just nine minutes before the first salvo of Minutemen would be fired.

Up to that time, contrary to claims in our doctored histories, the Soviet submarines had not fired on the East Coast cities. As a matter of fact, only a few ever got a chance to fire at all since most of them were destroyed by 50-megaton bombs within minutes after the order to fire the missiles was given. The few kiloton bombs the surviving submarines fired fell aimlessly and almost harmlessly on American soil at least 10 minutes after we were fully committed, though, of course, more than a half hour before our missiles landed in Russia. The later tampering with time to justify our act as one of retaliation has never convinced our allies. Indeed, this fabrication became one of the bones of political contention during the first post-war year.

No one knows how much of the message from California Stevenson may have heard for he never reacted to the caller, who was an astronomer from the Mount Wilson Observatory. Stevenson apparently fainted while listening to the astounding report of the astronomer who was patiently repeating it for the eighth time in the effort to pass it on to some official in Washington. The astronomer had no idea that while he was trying to get some one to pay attention to his story, a fateful decision had already been made on a false assumption which he might have corrected earlier.

The President learned of it just five minutes before the missiles were to fly. A sleepy operator in the Defense Department, who had listened to the story, considered it fantastic enough to amuse an officier on night duty. By a circuitous

route, it reached Secretary McNamara and precipitated the most brilliant rapid-fire debate I have ever witnessed. When the Secretary informed the President that, according to the California astronomer, the electronic blackout had been caused by a spectacular natural event in outer space, Mr. Kennedy wanted to countermand his orders immediately. His brilliant mind raced around the perimeters of the problem seeking an exit from his terrible dilemma. Finally, in helpless defeat, he recognized that only by letting the missiles destroy the counterforce targets could he hope to prevent a massive Soviet retaliation for the damage that would be done by those bombers which could not be recalled.

Based on our study of the transcripts of conversations between Moscow and London (among our most valued censored documents), it is quite clear the Khrushchev was informed of the cause of the blackout very soon after it occurred. Soviet astronomers were at work while most American astronomers were in bed. Some unreliable but believable bits of information indicate that Khrushchev at first assumed it was the West which had imposed the blackout as a prelude to an attack, and he was moving rapidly to pre-empt (or retaliate) when the correct interpretation of the event reached him. Even so, had it not been for the convincing assurances from London and Paris, it is likely that the suspicious Russians would have struck rather than risk a U. S. surprise attack under the advantageous circumstances of the blackout.

The U. S. strike by both ICBMs and 1500-mile missiles carried by the bomber squadrons was absolutely devastating, destroying at least 80 per cent of the Soviet retaliatory force within less than an hour. The fantastic blow came as a complete surprise and wiped out the entire top echelon of the Soviet ruling circle. Without command and control, the remaining Soviet bases could not react quickly. They became easy targets for the almost untouched SAC bombers whose mop-up operations were simplified when the electronic interference began to fade shortly after the first strike.

Although the attack was strictly limited to counterforce targets and was apparently very accurate, we subsequently calculated more than 50 million Russians dead--twice as many as the American official figures ever admitted. Some 75% of those casualties were caused by fallout upon unalerted populations in the target areas.

American casualties caused by the inept and sporadic retaliations did not reach the million mark. Many lives were lost later from the fallout in the backlash of our own nuclear attack. This stemmed largely from the poor organization and discipline of the civilian protection organization and because surprising numbers refused to take shelter in moral protest.

The President worked feverishly, under stimulants, to formulate a policy for this unprecedented predicament. During the early morning hours following the disaster, he outlined a plan designed to seek reconciliation with a hostile world. His central concern was to tap somehow the religious revival he anticipated to save the value-system of the Western world and to unite the survivors in a world government. I have reconstructed this remarkable dialogue with his advisers, relying upon their memories and my notes, in the lengthy prelude to Volume II which deals with "Conflict and Consequences." This is the only complete record of it.

No one can be certain whether our democracy might have been preserved under the imaginative leadership of the President. His embryonic policy ideas had no chance to mature or be tested before he was incapacitated by a crazed pacifist who deliberately drove a truck into the Presidential limousine on the road back to Washington. He lay helpless and speechless with a broken back at Walter Reed Hospital.

In the days and weeks that followed, the United States, with its vast preponderance of military power but without plan or long-range purpose, was drawn into one conflict after another. Settlements were dictated by its power though it could not seem to control the chaos that continued to mount in many places.

Chinese forces from Formosa invaded the mainland within a few days. Red China sought vainly to stave off defeat by using its limited arsenal of atomic weapons thus bringing to bear the nuclear power of the Seventh Fleet in support of the Nationalist "liberation" forces. Soviet units in East Germany and the Eastern European satellites were disarmed and expelled. Israel with the help of France seized the Suez Canal and established its hegemony over the Middle East. With the breakup of NATO, the reunified Germany posed new threats to Western Europe. Berlin announced its intention of occupying and completing the disarmament of defeated and prostrate Russia, held in check only by joint Anglo-American threats to prevent it.

The weak and vacillating Vice President Bolton who had taken over from the paralyzed and mute President confronted a Congress and a nation in growing disarray. He temporized and compromised in hopes of finding a new national posture which might attract majority support and thus enable the United States to exercise its undisputed power with responsibility. But the chasm between the warring factions was already too great and widening daily as the year 1965 ended.

The prolonged crisis which preceded the disaster had brought to the fore a new party of extreme nationalism and isolationism. In the wake of the war, this party with its strong base in the South, calling itself The American Coalition, raised the only voice of certainty of behalf of unequivocal policies. Its dramatic leader, Admiral William Tell Talker (retired), dominated the national media with his demands for Pax Americana and his slogan, "Peace Through Strength." His vitriolic denunciations of the internationalists and the liberals as traitors precipitated many a riot which his more fanatical followers usually ended in an orgy of violence.

The American Coalition drew its power from a shrewd assessment of the public temper. It sought to exploit the tremendous burden of guilt under which the majority staggered aimlessly in acrimonious debate.

Its propaganda played upon the deep seated fears of retribution at the hands of anti-American masses all over the world, especially in Asia, if the United States should naively rely upon a handful of votes in a world parliament to protect its vital interests. On the other hand, the Coalition boldly repudiated the moral censures and offered a rationale to exorcise the guilt feelings. It characterized the "great miscalculation" --in the phrase of the internationalists--as the inevitable end of a futile "no-win" policy forced upon the country by a minority of pacifists and pinks. The nuclear attack was justified as a necessary retaliation in the face of a new Pearl Harbor--made necessary by a failure of will for forty years to use American power to stop and roll back the advancing Communist forces. The Coalition manufactured its own facts to support its thesis--repeating over and over, for example, that the Soviet submarines struck first.

It is perhaps not surprising that in the emotion-charged atmosphere of those confusing post-war months, this rather satisfying interpretation of events should be swallowed uncritically by many. Yet the appeal of the Coalition lay primarily in its simple, dynamic 12-point program. Its aim was

peace; its method, the threat of nuclear devastation. It called for forced disarmament of the rest of the world and American inspection to assure exclusive U.S. control of the ultimate military power for all time. It then disavowed any other claims or interests outside Fortress America.

As Admiral Talker so often reiterated, "Let the rest of the world go by without our help or hindrance. Let other nations fight among themselves with sticks, stones, or pistols, but not with weapons of mass destruction. Let them live and die as they please, but prevent them from disturbing our peace and prosperity with their disruptive ideologies and crafty diplomacy."

The hatred and fear of the outside world was reflected in the interminable debates at the United Nations where Secretary Stevenson vainly sought to moderate passions and pave the way for a revision of the Charter. Attacks on the Secretary of State in Congress mounted in numbers and intensity as the American Coalition approached control of both Houses with votes from many Southern Democrats and right Republicans.

In spite of the opposition, Stevenson continued to press in Congress for an arms control plan by which all nations under UN supervision would move by stages toward total disarmament. According to his plan, a U.S. arsenal of thermonuclear weapons and delivery systems would be transferred to an international authority to police the agreement. This, he insisted, would protect all against any clandestine cache of weapons. The nationalists vowed never to surrender American control to an international body and tried to force the resignation of the Secretary of State.

The issue suddenly came to a head with the appearance of two Soviet atomic-powered submarines off the California Coast. It had been assumed that all the surviving Soviet submarines had surrendered to the American Navy shortly after the war. These two, listed as destroyed, were commanded by fanatical Communists who had brain-washed their crews and forced them to hold out in the hope of using their missiles in behalf of a revanchist movement. Fearing that they would soon be betrayed by a missing crew member who was assigned to the last supplying raid in Alaska, the mad commanders decided at least to punish the Americans with the missiles they had before being captured. On January 5, 1966, they almost simultaneously fired their salvos at Los Angeles and San Francisco, reducing these great cities to rubble and killing close to 80 percent of the inhabitants.

Admiral Talker seized upon this ghastly incident to put through his program. Holding the temporizing President responsible for the loss, he painted a frightful picture of what could be done with the remaining stocks of nuclear weapons in Russia, China, and Western Europe if the United States did not use its power at once to disarm the world and impose a Pax Americana. It took only a few days to bring public opinion to a white heat in support of impeachment and the elevation of Admiral Talker from his post as Speaker of the House to the Presidency.

The first hundred days of his administration saw the ruthless suppression of all opposition, the expulsion of the United Nations, and the systematic organization of disarmament by threat. The Monday after Easter, President Talker delivered a triumphant Report to the Nation. He ended by pinning the first medal of the American Party on the breast of the paralyzed and speechless John Kennedy, whose tremendous act of will had, he said, liberated his country from Communist foes, internal and external, and opened the gates to everlasting peace. The former President, propped up in a wheel chair before the television cameras, could not even move the muscles of his face to frown upon this celebration of his "great miscalculation".

Once again the powerful urge toward legitimacy prompted a dictator to perpetrate a lie which he made the foundation stone of his power. The fact that only the scattered leaflets of the struggling Democratic Underground opposed the deception testified to the total eclipse of freedom. Month by month since that day, history has been rewritten on order from the White House. Surprisingly--perhaps not so surprisingly--the deceptions have always been justified by the new intellectuals in the service of the regime on the grounds that they are in the national interest. The ultimate power, according to them, does not reside in the exclusive control of weapons, but in the will to use them to maintain security and peace. All doubt of moral position must therefore be removed so that Americans can walk the world with pride. The end really justifies the means.

Many among the underground forces were sustained in their struggle by the conviction that such a travesty upon the American dream could not long endure without a credible enemy. Unhappily, they underestimated the ingenuity of a power-hungry group, at least in its first generation, just as some of them formerly discounted the staying power of the Communists. Those who came to power promising emancipation from foreign influence and a good life lived in splendid isolation soon conjured up terrifying foreign threats to security. Plots to wage bacteriological and chemical warfare against Fortress America were exposed in various

parts of the world. It was claimed that the Communists, though defeated and disarmed, were organizing the discontented for the day of revenge. Nothing less than an American foreign legion, supported by huge corps of inspectors and supervisors, could guarantee the new security.

Historians, steeped in the literature of empires, intimately familiar with the rise and fall of Rome, will see the beginning of the end in the vain attempt to rule the world from an "eternal city". In this day and age, the advanced and advancing technology makes the modern Caesar utterly dependent upon the men of science and technology. It is amongst this fraternity that the underground must build, recognizing that in the grudging freedom granted to this breed of men resides the only hope of restoring freedom to all men. Political, economic, and personal freedom came by this route before. Some of us thought we saw it coming again by the same route in the Soviet Empire.

Perhaps we were wrong in counseling firmness with patience, in espousing a policy of containment and foregoing the risks of trying to "win the Cold War". Curiously, in winning by miscalculation, we lost the values we sought to preserve in the precarious balance of terror. But for the difference of night and day between Washington and Moscow, the decisions might have been reversed and the balance broken by the other side.

At the end of Volume III, I could not resist speculating on what a reversal of the catastrophic event might have meant to our way of life. This struck me as a provocative way to encourage readers to reflect upon the meaning of the real events.

In that speculation, I make certain assumptions about our state of passive and active defense since I could not envisage a first strike from the other side that we could have sustained and from which we could have recovered given the poor organization of civilian and industrial protection as well as air defense we had in 1965.

Suppose in this hypothetical case that it is midnight in Moscow. Imagine that Khrushchev and his associates are plotting the next move in the growing crisis when the electronic blackout occurs. There is no doubt in their minds that it has been engineered by the West. They are only surprised that the "degenerate" leaders are showing such resolve rather than backing down. They are divided over whether it means a cover for a coming attack or just another step up the escalation ladder. The evacuation of the major cities in America a few days earlier is cited to support those who are convinced that an attack is to be expected. The

Soviet leaders are painfully aware that the Americans have taken civilian and industrial protection seriously in the years since the Berlin crisis forced them to undertake such defensive measures. Moreover, they are worried about the high state of American air defense and the super-alert of the strategic forces.

"If they are not striking us out of the blue," says Khrushchev, "and I for one do not believe they would risk it, then a first strike from us will bring an annihilating retaliation. Why should we risk that?"

"Because," argues his Marshall, "war now has become less dangerous than peace."

"Not quite yet," Khrushchev snaps. "There is still the telephone and the standby cable. It would be cut by now if we had initiated an interference against them, but since they are blocking out only our radar, it is still working--I hope."

The midnight call from Moscow goes through quickly. Gromyko talks to Stevenson. Under instructions, the Soviet Foreign Minister starts off with an ultimatum on the grounds that the best defense is a strong offense. "If you do not lift your blanket over our electronic systems within 15 minutes, you may expect the worst. And let me tell you that the intended black-out is only partially successful. There are many holes in it."

Stevenson replies, "This is no time for more threats. Hold on a moment while I consult." He scribbles a note and pushes it across the desk to the President.

The President takes the phone. "We must reject this attempt to accuse us of doing what you have already done. You know that we can retaliate in a massive way if you hit us, and you should have no doubt that we will. I propose a 24-hour standstill while we arrange a mutually inspected reduction of our respective alert postures. This will give you time to reconsider the electronic interference and avoid a catastrophe that neither of us wants. I am prepared to exchange pledges with Chairman Khrushchev now."

After a pause, Khrushchev comes on. "Twenty-four hours, yes; but only if you order the immediate suspension of your electronic interference."

More notes cross the table. Chip Bohlen, our most experienced adviser on Soviet relations, whispers, "He's trying to save face. Say you will if he will."

Khrushchev replies curtly, "I will hold you to it--15 minutes." After hanging up, he turns to his Marshall, "Look, you gambler, how dare you take a step like this without my permission?"

"Nonsense, we have taken no such step," says the Marshall, "Kennedy is only trying to save face. Give him 15 minutes to make good. If he doesn't, let's fire."

In 15 minutes they order the ICBMs to fire. In 20 minutes, Kennedy learns that the blackout has been caused by natural phenomenon. He so informs Khrushchev by phone. Skeptically, the canny Russian pretends he already knows. "A likely story, I can imagine him saying as an aside to his colleagues. "But how do I know you won't take advantage of this blackout?" he asks Kennedy.

"Under the circumstances," Kennedy replies, "we just have to trust each other. Anyway, this unprecedented global interference is likely to do unpredictable things to the calculations on which our military experts count. Even if you could rely upon your calculations, we would still have enough invulnerable retaliatory power to deliver an annihilating blow. And I assume the same applies to you. The caution with which both of us have approached every stage of this crisis is the only mutual guarantee that neither of us now is likely to make an irrational move. The standstill agreement still stands, I trust."

Khrushchev leaves the impression that it does and agrees to open negotiations via telephone within three hours. Since both sides had recalled their ambassadors some days before as the crisis reached new heights, diplomatic channels are considerably restricted. Khrushchev proposes that his delegate at the United Nations, Zorin, fly down to Washington and invites the President to send an Ambassador from a European capital to Moscow by supersonic military jet.

They hang up, and Kennedy, in good faith, goes to work on an American position.

Khrushchev immediately asks, "Can we stop those birds?" The Marshall shakes his head. "Some are on their way. We cannot stop now." At his trial later, the Marshall is shown to be an unregenerated Stalinist. Shortly before the bombs begin to fall in the United States, Khrushchev learns that Kennedy's story was the truth.

I visualize a devastating Soviet blow, causing 50 million American casualties and the partial or near-total destruction of 32 major cities. Yet, because of the interference, more than a third of the counterforce targets escape. This, taken together with the super-alert status of our nuclear striking force, assures a powerful second strike. The devious character of the Soviet attack insures an unhesitating retaliatory strike which is quite crippling.

With the lifting of the blackout, the Soviets realize that the U.S. is in a position to do annihilating damage. Moreover, blackmail threats against American cities are of little avail in the light of the widespread evacuation. Fearing German or Chinese moves against the homeland if Russian forces are further depleted, Khrushchev agrees to a stalemated peace.

While this imaginary course of events may seem rather incredible, it at least provides a stimulation to the imagination helpful to the exploration of the questions I raise at the end of Volume III. The main question is this: under some circumstances, the reverse of what actually happened, what is likely to be the fate of our democratic values?

I consider it worthwhile to probe into this question since so many, especially in the underground, argue that our values and our system could not have survived a thermonuclear war of any description. Actually, it was my own view before 1965 that the only hope for our civilization lay in deterring war while seeking a way to end the arms race and establish world law. I took a dim view of the costly program of civilian and industrial protection; for in my layman's view, if war started, it would inevitable end in mutual annihilation. Certainly, nobody ever dreamed that what did happen could possibly occur. History is just that much richer than any human power of speculation.

In retrospect, I have visualized many different wars under many different circumstances. And in some of them, it appears quite reasonable that our values could be used in recovering and rebuilding our way of life. Indeed, in some situations, I can see them emerging in invigorated forms. Much would depend upon how well prepared we were to survive the first hours and days after the war.

In the case I have conjured up, our moral position would undoubtedly be a source of strength and self-confidence. Instead of facing a hostile world, we would be surrounded by a sympathetic and friendly world. Our adversary would find himself hated and isolated. We might even expect trade and aid from abroad to tide us over the early months of adjustment. I suspect that the survivors, facing a more spartan mode of life, would exhibit the virtues of our pioneer forefathers in the primitive environment of the frontier--hard work, mutual aid, and thrift. People would forget about the three-day week and welcome all the automation science could provide.

Far from being brutalized by the experience, I dare say that the survivors would show a higher sense of personal responsibility, a more cooperative spirit, a great appreciation of human suffering. Some of the more callous and cruel attitudes of the affluent society may well be moderated.

At the same time, I do not see the survivors wholly preoccupied with their unprecedented domestic problems. Many would, I believe, dedicate themselves to creating a new international order to prevent a repetition of such a disaster.

Such speculations at least sharpen our perspective on modern war. They suggest that much depends upon how it starts, how it is conducted, and how people are prepared to survive and recover. Few would have imagined before the "great miscalculation" that the United States could practically eliminate its Communist opponents with minor damage to itself and in the process, lose its democratic way of life. No one ever gave a moment's thought to the possibility of gaining the whole world and losing the nation's soul.

By imagining ourselves victimized, sustaining appalling tragedy and damage, struggling to recover and rebuild in a friendly world, we can at least see our problems in the light of contrast.

It is against this backdrop of the contrasting hypothetical wars that my colleagues and I have developed a long-range plan to reclaim the values we have lost.

The Schlesinger letter, obviously unfinished, ends without a summary of the plan to which he alludes. His brief comments leave many questions in search of more satisfactory answers. Is it necessarily so that democratic values cannot survive a war? If they conceivably could, then what advance planning for physical survival and recovery might give these values greater chance of perpetuation in a post-war world?